ANNUAL REPORT 2021/22

science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA

technology innovation
AGENCY
Innovating Tomorrow Together

HIGHLIGHTS 2021/22

Achieved an output performance of **86%** (19 out of 22 targets).

Disbursed more than **90%** of its MTEF allocation for the third consecutive year.

Achieved an efficiency ratio of **28%** against a target of 30%.

480

Active disbursing projects under management.

Unqualified audit for the **11th** consecutive year, and a clean audit for the second consecutive year.

14

New project agreements totaling R102.2m entered into under the Innovation Fund.

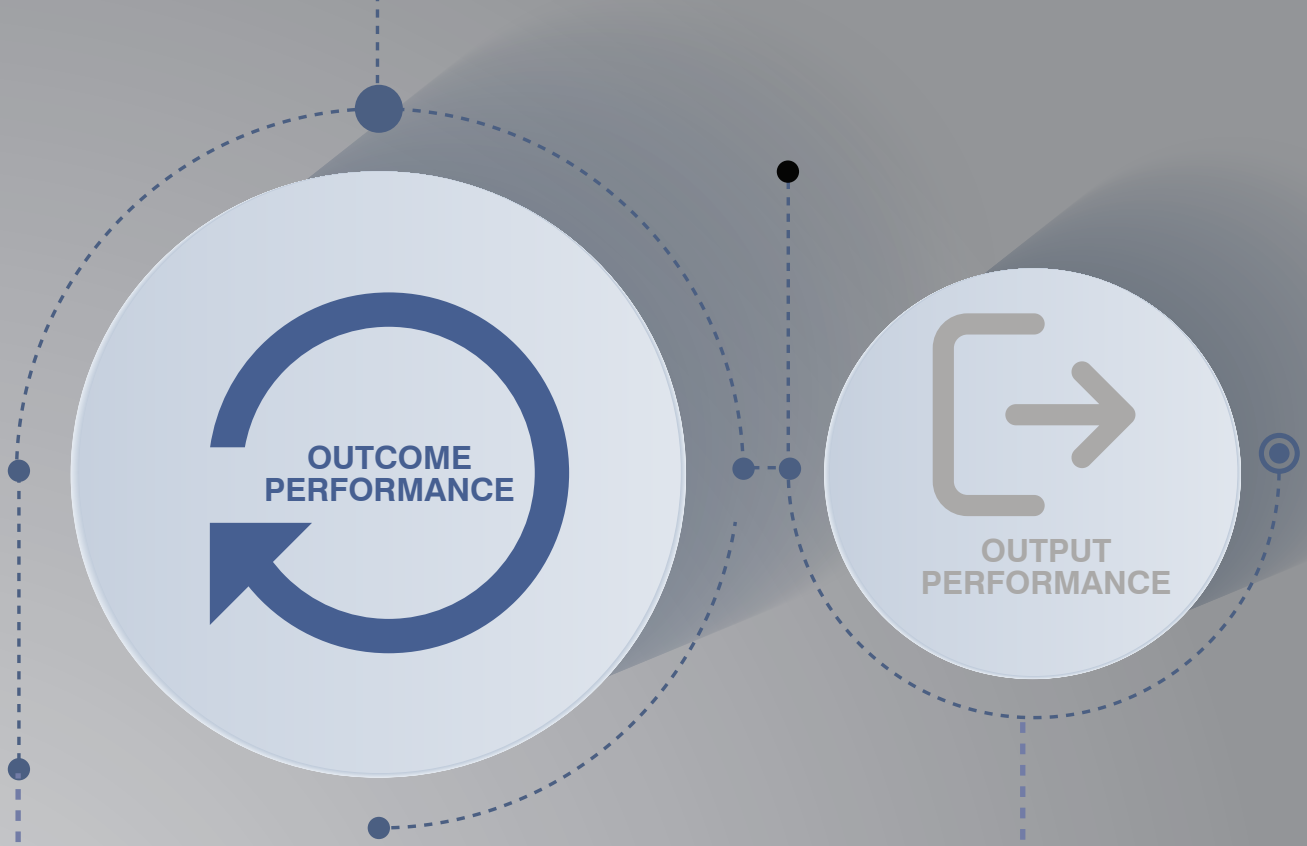
Industry Matching Fund leveraged

R500m

at the Fund level and R1bn at the project level against R28m of TIA funds, creating 12 companies and 76 jobs.

3

New Living Laboratories established in 2021/22 in underserved provinces ahead of schedule.



Indicator	Target	Achievement
Technologies licensed or assigned	9	10
Bio-based technologies developed	15	36
Technologies diffused for inclusive development	9	12
Products launched	22	37
Joint collaborations	15	34
Leveraged funds	R239m	R746.5m
SMMEs and cooperatives supported	3,500	3,167
Postgrad students and post-docs	95	96
Knowledge and innovation products	130	179
Technology Stations supported	18	18
Technology Platforms supported	8	8
Technology Innovation Clusters supported	8	7
New Technology Platforms established	1	1
New technology and innovation support centres established	0	3

Indicator	Five-year target	2020/21 performance	2021/22 performance	Cumulative achievement and target
Technologies commercialised	175	26 against a target of 9	49 against a target of 31	75 against a target of 40
Demonstrated bio-based technologies	75	37 against a target of 9	36 against a target of 12	73 against a target of 21
Bio-based entrepreneurs supported	600	165 against a target of 105	45 against a target of 110	210 against a target of 215
SMMEs supported	15,750	1,990 against a target of 2,390	3,167 against a target of 3,150	5,157 against a target of 5,540

Table of Contents

PART A

GENERAL INFORMATION

PART B

PERFORMANCE INFORMATION

PART C

GOVERNANCE

PART D

HUMAN RESOURCE MANAGEMENT

PART E

FINANCIAL INFORMATION

PART A

General Information

Registered name	Technology Innovation Agency
Registration/constitutional information	Technology Innovation Agency Act (No. 26 of 2008), as amended by the Science and Technology Laws Amendment Act (No. 7 of 2014) and the Science and Technology Laws Amendment Act (No. 9 of 2020)
Registered office address	TIA House, 83 Lois Avenue, Menlyn, Pretoria
Postal address	P.O. Box 172, Menlyn, Pretoria 0181
Telephone	+27(0)12 427 2700
Email	info@tia.org.za
Website	www.tia.org.za
Social media	LinkedIn: www.linkedin.com/company/technology-innovation-agency Twitter: @tiaorgza Facebook: www.facebook.com/TIAORGZA
External auditor	Rakoma & Associates Inc. Building B, Monte Circle Office Park, 178 Monte Casino Boulevard, Fourways, Johannesburg 2191
Banker	Standard Bank 30 Baker Street, Rosebank 2196, Johannesburg
Company Secretary	Mr Kobus Louw (Board Secretariat)

1. LIST OF ABBREVIATIONS AND ACRONYMS

4IR	Fourth Industrial Revolution
ABIPP	Agriculture Bio-economy Innovation Partnership Programme
AFS	Annual Financial Statements
AI	Artificial intelligence
API	Active pharmaceutical ingredient
APP	Annual Performance Plan
A&RC	Audit and Risk Committee
B-BBEE	Broad-Based Black Economic Empowerment
BEFV	Bovine ephemeral fever virus
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CleanTech	Clean technology
COVID-19	Coronavirus disease 2019
CSIR	Council for Scientific and Industrial Research
DSI	Department of Science and Innovation
EAP	Economic Active Population
FBIC	Forest Bio-economy Innovation Cluster
GCIP-SA	Global CleanTech Innovation Programme-South Africa
GDP	Gross domestic product
GRAP	Generally recognised accounting practice
HDI	Historically disadvantaged individual
H3D	Drug Discovery and Development Centre
HIV/AIDS	Human immunodeficiency virus infection or acquired immune deficiency syndrome
HR&REMCO	Human Resources and Remuneration Committee
ICGEB	International Centre for Genetic Engineering and Biotechnology
ICT	Information and Communication Technologies
IDC	Industrial Development Corporation
IFC	Investment and Finance Committee
IID	Innovation for Inclusive Development
IKS	Indigenous Knowledge Systems
IP	Intellectual property
IPR-PFRD	Intellectual Property Rights from Publicly Financed Research and Development
ISED	Innovation Skills and Enterprise Development
ISO	International Organization for Standardization
LSDV	Lumpy skin disease virus
m	Million
MTEF	Medium-Term Expenditure Framework
MTSF	Medium-Term Strategic Framework
NDP	National Development Plan
NIPMO	National Intellectual Property Management Office
NIPP	Natural Indigenous Products Programme
NMU	Nelson Mandela University
NSI	National System of Innovation
OTT	Office of Technology Transfer
PFMA	Public Finance Management Act
R&D	Research and development
SA	South Africa
SABDI	South African BioDesign Initiative
SAMRC	South African Medical Research Council
SAHPRA	South African Health Products Regulatory Authority
SET	Science, engineering, and technology
SFP	Seed Fund Programme
SIIP	Strategic Industrial Bio-innovation Programme
SME	Small and medium enterprise
SMME	Small, medium, and micro enterprise
STI	Science, technology, and innovation
TADF	Technology Acquisition and Deployment Fund
TIA	Technology Innovation Agency
TICP	Technology Innovation Cluster Programme
TPP	Technology Platforms Programme
TSP	Technology Stations Programme
TVET	Technical and Vocational Education and Training
UCT	University of Cape Town
UFS	University of the Free State
UK	United Kingdom
UP	University of Pretoria
UTF	University Technology Fund

2. THE TIA BOARD

Ms Matsi Modise
Chairperson

Mr Patrick Krappie
(ex officio)

Ms Anati Canca

Dr Revel Iyer

Ms Lindiwe Matlali

Mr Butana Mboniswa

Ms Sebenzile Matsebula

Mr Thabiso Ramasike

3. FOREWORD BY THE CHAIRPERSON

Ms Matsi Modise
Board Chairperson

On behalf of the Board, it gives me great pleasure to present the Annual Report of the Technology Innovation Agency (TIA) for the 2021/22 financial year.

The Agency fulfils a key role in South Africa's National System of Innovation (NSI) by bridging the gap between promising local research and the market by de-risking technological innovations. Through its funding efforts and other non-financial interventions to nurture the innovation ecosystem; entrepreneurs and businesses are better positioned to secure follow-on funding to bring their innovations to market. This is particularly necessary in a post-COVID-19 environment in which the pandemic and associated lockdown measures have reversed some of the hard-earned gains made to improve the livelihoods and wellbeing of all who call South Africa home.

The South African economy has weathered a most devastating period during the past year. I am pleased that most sectors have demonstrated much resilience in adapting to our new reality of a more digitised culture at work and at home.

New risks have emerged with hostilities in Eastern Europe having grave implications for the global economy. The consequence for our economy has been felt almost immediately with imported inflation affecting our entire economy due to constrained trade of bulk commodities such as wheat and petrochemicals. We are much encouraged by the resumption of global trade with increasingly diversified supply chains creating for more healthy competition and resilience, and a great opportunity for our innovators and the global innovation sectors.

I was privileged and honoured to have been appointed to take up the role of Chairperson of the TIA Board in November 2021, in the second year of implementing TIA's 2020-2025 Strategic Plan. Since then, I and my fellow Board members have been amazed by the impressive work that the Agency accomplishes. For the year under review, TIA achieved positive results with a commendable 86% of its annual targets. Impressively, the results for the year demonstrate the Agency's efforts to increase the rate of commercialisation of promising technologies in the country whilst maintaining a sharp focus on building a pipeline of de-risked technologies for the benefit of the NSI. I am also pleased to report that TIA received an unqualified audit for the eleventh consecutive year. This achievement is a result of maintaining and improving on a healthy internal control environment.

In the context of government's outcomes-based approach, public-funded entities like TIA are increasingly required to make an impact on society and contribute to the alleviation of South Africa's triple challenges of poverty, inequality, and unemployment. In this regard, TIA has invested in a significant portfolio of projects in bio-economy that are geared to addressing poverty through innovations in agriculture, health, indigenous knowledge systems, and the environment.

In the context of government's outcomes-based approach, public funded entities like TIA are increasingly required to make an impact on society and contribute to the alleviation of South Africa's triple challenges of poverty, inequality and unemployment.

Through its commercialisation mandate, TIA has a significant role to play in addressing unemployment through the support of start-ups and technology-driven small, medium and micro enterprises (SMMEs) that can create jobs. This is particularly important especially in the aftermath of the COVID-19 pandemic that has negatively impacted the performance of our economy and contributed to significant job losses. I am most proud of the work done by our organisation through the deployment of a variety of interventions through its Technology Stations and Technology Platforms programmes that have seen well in excess of 3,200 SMMEs receiving value-adding support, including product development, testing against specifications, prototyping and even short-run productions. This growing ecosystem is a strategic investment into our nation's contribution towards the knowledge and creator economy.

The White Paper on Science, Technology and Innovation is framed around the imperatives of inclusive development and transformation, deliberately to address challenges of inequality in the NSI. TIA has continued to make concerted efforts to increase the role of previously disadvantaged individuals, inclusive of women, youth, and people with disabilities in innovation. In addition, to address the unequal levels of development in the country the agency has taken deliberate steps to increase its support and distribution of resources towards underserved provinces.

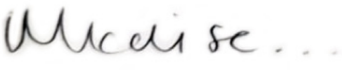
Whilst the Agency has achieved these important milestones, there is no question that there is much that remains to be done to strengthen its role in addressing South Africa's developmental challenges through innovation. For this purpose, our shareholder, the Department of Science and Innovation (DSI), has instituted a review of TIA championed by the Minister to take stock of the Agency's performance since its establishment, and to identify measures that would serve to position the Agency strategically to optimise the execution of its mandate.

My fellow Board members and I are excited about this process and look forward to leading an agency that is effective in responding to key priorities of government and the needs of our stakeholders. We are encouraged that Management has stepped up its efforts to make TIA more visible and accessible to all segments of society who can benefit from its offerings.

On behalf of the Board, I would like to thank the leadership of the DSI, the Honourable Dr Bonginkosi Nzimande, the Director-General, Dr Philemon Mjwara, and his leadership team for their unwavering support. I would also like to thank my fellow Board members for picking up the baton with energy and commitment to make TIA work, in particular my predecessor, Mr Butana Mboniswa for his stewardship of the Agency during the year under review.

It has been my singular privilege to work with our dedicated Executive Management team and the staff of TIA for their dedication in delivering this great performance. The commitment of Mr Patrick Krappie and his team has inspired me most about our work. The TIA platform is a critical partner in delivering true value to our economy.

I have full conviction that we will prove to be the necessary agent towards the required gravitas needed to produce an economy that delivers for the needs of our people. TIA's time is now.



Ms Matsi Modise
Chairperson

4. THE EXECUTIVE MANAGEMENT TEAM

Mr Patrick Krappie
Acting Chief Executive Officer

Ms Petro Dekker
Executive: Corporate Services

Mr Ismail Abdoola
Chief Financial Officer

Mr Brian Mphahlele
Executive: Commercialisation

Dr Vuyisile Phehane
Executive: Bio-economy

Mr Vusi Skosana
Acting Executive: Innovation Enabling

5. CHIEF EXECUTIVE OFFICER'S OVERVIEW

Mr Patrick Krappie
Acting Chief Executive Officer

I am pleased to present the Annual Report of the Technology Innovation Agency for the financial year 2021/22. This report presents the results of our efforts in advancing the Agency's mandate and the emphasis on our strategy for the 2020-2025 strategic cycle.

To recap, the TIA strategy is based on three pillars:

Firstly, to build on the gains of the past years in which TIA built a significant portfolio of early-stage technologies that have been de-risked, enabling other investors to take these to market. In this we have sought to enhance the Agency's commercialisation efforts.

Secondly, increasing the role of the bio-economy as an important contributor to South Africa's economic development. The bio-economy currently contributes more than 8% to the GDP, and efforts to implement the Bio-economy Strategy aim to significantly grow this contribution going forward.

The last pillar is to increase the participation of entrepreneurs, innovators, and SMMEs in technological innovation by enabling access to key infrastructure capabilities such as Technology Stations and other innovation-enabling interventions.

This being an assessment of year two of the organisation's performance against its strategy, it is important to reflect on the journey, enabling us to better prepare the Agency for enhanced performance in the future.

During this period, TIA recorded an achievement of 86% of its annual output targets. The results for the year under review show that TIA has delivered significant results against its commercialisation objectives with a good number of technologies licensed, diffused, and launched in the market through start-up companies. TIA has commercialised a total of 59 technologies against a target of 40.

True to its de-risking mandate, TIA has also delivered positive results with a significant number of new projects onboarded in the year through its various instruments and programmes. In total, TIA holds a portfolio of 480 projects that are actively disbursing and are, therefore, under management. In this regard, significant progress has been made in advancing much of this portfolio towards higher levels of maturity, with at least 37 projects reaching demonstration stage and which are ready to attract investors that will take these to market.

> TIA has an important role to play in supporting entrepreneurs, innovators, and technology-based SMMEs.

TIA has an important role to play in supporting entrepreneurs, innovators, and technology-based SMMEs. For this purpose, the Agency deploys a range of interventions such as the Technology Stations, Technology Platforms, Seed Funding, a Grassroots Innovation Programme, and a range of enterprise development interventions that are intended to promote the development and sustainability of tech enterprises. For the year in review, the organisation has supported no less than 4 000 innovators through these initiatives. These interventions have been particularly instrumental in helping innovators to contend with the negative impacts of the COVID-19 pandemic. Many of the entrepreneurs have also received opportunities to connect with international partners and markets through a range of international partnerships that TIA has forged with countries such as Brazil, UK, and Ireland – to name but a few.

The Department of Science and Innovation has established the Innovation Fund as a primary intervention to enhance and accelerate the rate of commercialisation of locally-developed technologies. As TIA, we were pleased to be afforded the opportunity to be part of a family of institutions charged with the responsibility of supporting promising technologies that require enhanced assistance towards commercialisation.

With an initial allocation of R80 million, the Agency has deployed these funds to support nine projects towards bio-economy related projects. Such projects include six IKS projects (R40.5 million) and five projects under industrial sectors. These funds were also utilised to strengthen our partnership with Fund Managers such as the University Technology Fund (UTF) that specifically targets innovations arising from IP born of publicly-funded research.

Partnerships are a critical component to realising the objectives of TIA's strategy. With its mandate spanning the entire innovation value chain, TIA seeks to forge strategic relationships with value-adding partners in order to bolster its early-stage funding and technology development mandate. Partnerships identified as being critical to accelerating commercialisation are also actively pursued. An important focus for the year under review has been to deepen our relationships with Science Councils that have the capacity to provide TIA with a strong pipeline of investment opportunities of publicly funded IP. This focus was deliberately undertaken to augment already strong relationships with the universities. Through these efforts, the Agency has seen almost 75% of its funding being directed towards the output of publicly-funded research.

The Industry Matching Fund has continued to serve as an important instrument for partnering with industry and other institutional investors. Through this, TIA has invested in 24 projects, 60% of which are from publicly funded IP, nine of these projects were commercialised, resulting in 12 companies being formed and the creation of 76 jobs. It is pleasing to note that a new, and significant, partnership has been forged with the SAB Foundation, which has shown tremendous interest in our Seed Fund portfolio.

These achievements should, however, not mask areas that require improvement going forward. One key area requiring attention is the turnaround time of the investment decision-making process. Many areas that require focus are complex requiring a significant time investment, such as the assistance provided to applicants when preparing bankable business cases. These are matters and areas of importance and will ensure that the Agency invests in the most deserving opportunities requiring funding from the fiscus. Whilst this has been raised as a point of concern by many of our stakeholders, adequate measures are being put in place to enable effective and quick decision-making processes.

I would like to thank the TIA Board for their unwavering support to the Management Team and the TIA staff for making these results possible. I also want to express my appreciation to my colleagues at the Department of Science and Innovation, in particular Dr Phil Mjwara and his Management Team for contributing to such a positive collaboration.

Mr Patrick Krappie
Acting Chief Executive Officer

6. CHIEF FINANCIAL OFFICER'S OVERVIEW

Mr Ismail Abdoola
Chief Financial Officer

Based on TIA's financial results for the period 1 April 2021 to 31 March 2022 (hereinafter "2021/22"), the Agency has maintained a sound financial performance despite the prevailing economic climate. Notwithstanding the tough economic climate and other challenges (such as the continuing impact of the COVID-19 pandemic), TIA received an unqualified audit for the eleventh consecutive year. This is in accordance with the Agency's commitment to maintaining a healthy control environment that is governed by sound financial principles and policies.

TIA commenced the financial year with a budget allocation of R447.7 million, an amount approved in the 2021/22 Annual Performance Plan (APP). Of this, R177 million (40%) represented the total commitment book, with just more than R270 million (60%) available for new investments and operational expenditure. With an approximate budget requirement of R165 million for operational expenditure (personnel and administrative costs), R105 million remained available for disbursement to new projects.

FINANCIAL PERFORMANCE

Total income for the year amounted to R633.9 million, representing a 10.8% positive variance when compared to the budget for the year. Positive variances in total income were largely attributed to income from managing specific contracts which represented a 6.7% increase over the previous year.

Total expenditure for the year amounted to R611.3 million, which is R39.1 million higher than budgeted for. This was contributed by a higher than projected investment expenditure of R52.2 million offset by savings in operational expenditure.

INVESTMENT PIPELINE

During the reporting period, efforts were devoted not only to managing the existing portfolio, but also to building a pipeline of investments. Total disbursements for the year amounted to R458.9 million, representing a 9.4% increase on the previous year. It is worth noting that, for the third consecutive financial year, TIA has dispersed more than 90% of its Medium-Term Expenditure Framework (MTEF) allocation.

In line with the implementation requirements of the Bio-Economy Strategy, a total of R221.5 million was disbursed to projects related to the bio-economy. Funding made available through the Innovation Fund contributed towards a 10% increased allocation of funds directed towards commercialised innovation compared with the previous year. In line with the strategic role of the entity in the NSI, a total amount of R41.8 million was invested in the Seed Fund Programme (SFP) portfolio. This amount represents a significant investment in early-stage projects in which traditional investors do not deploy funds. Such early-stage investments are expected to create a significant pipeline for investors in the NSI in future.

> *The Agency has maintained sound financial performance despite the prevailing economic climate economic climate.*

INNOVATION FUND

As at year end, TIA had successfully contracted all nine projects from the bio-economy portfolio, which included projects related to six indigenous knowledge systems (IKS) under the Natural Indigenous Products

Programme (NIPP) Fund. These projects are managed through the Industrial Development Corporation (IDC) in the order of R40.5 million. A total of R31.4 million has been disbursed to the relevant projects to date.

For the commercialisation portfolio, TIA contracted five projects totalling R21.5 million, with R15.4 million having been disbursed. In addition, a further R10.5 million was approved and disbursed for investment in the University Technology Fund (UTF). In total, therefore, 72% of the first-round fund has been disbursed, with further disbursements expected in early 2022/23, based on the achievement of milestones.

TIA secured further funding to implement a second round of the Innovation Fund after successful engagements with its shareholder, based on TIA's significant investable project pipeline. During February 2022, TIA entered into funding agreements totalling R102.2 million with successful funding applicants as part of implementing round two of the Innovation Fund.

PROCUREMENT

TIA's use of the National Treasury's Central Supplier Database allowed the Agency to spread its purchasing reach to smaller suppliers who generally struggle with high barriers to entry into supply chains and procurement expenditure. TIA does not procure goods and/or services from suppliers who are not fully tax compliant, in this way contributing to the fiscus. The procurement strategy continues to focus on increasing expenditure with small businesses and those businesses owned by previously disadvantaged individuals (in line with government priorities and objectives).

SURPLUS FOR THE YEAR

TIA realised an actual surplus of R22.6 million for 2021/22. This is largely attributable to a combination of greater income generated, lower than anticipated investment expenditure, and savings on operational expenditure.

Technology development is an inherently high-risk undertaking due to the unpredictable nature of the intended outcomes. In such an environment, there is a high probability that investee project-related milestones will not be achieved as planned, making it difficult to forecast and deliver zero surplus/deficit actuals at the end of each financial year. By 31 March 2022, the Agency had funding commitments to projects totalling R238.7 million. Section 53(3) of the Public Finance Management Act (PFMA) stipulates that public entities must submit a request to National Treasury to retain any surplus funds.

EFFICIENCY RATIO

More significantly, TIA's management remained committed to and continued the drive to allocate savings from operational expenditure to investments Owing to the lockdown regulations that restricted travel and led to office shut-down and minimal use of TIA offices, the organisation realised savings of R8 million for the year. Cost savings were also realised through a reduction in the use of consultants. Instead, TIA relied more on its own internal expertise and capabilities. A decrease in travel expenditure was achieved by leveraging digital platforms to host meetings and other business engagements. Further savings were realised on lower facility management costs due to remote working as a result of lockdowns imposed during the COVID-19 pandemic.

These funds were directed to projects and programmes under the Innovation Enabling Division such as the SFP, Innovation Skills and Enterprise Development (ISED), and other innovation for social impact investments and initiatives that operate with modest budget allocations. TIA's executive management remains committed to improving its operational efficiency, particularly the allocation of operational expenditure savings to investment expenditure. This improved the efficiency ratio (percentage of total income towards non-investment expenditure) to 28% in 2021/22 against a target of 30%.

BUDGET 2022/23

Going into the new year, TIA has an allocation of R458.4 million with a commitment book of R238.7 million, with more than R219.6 million available for investments and operational expenditure. While this funding remains inadequate for the purposes of fulfilling the organisation's mandate effectively, the additional funding from round two of the Innovation Fund (R102.2 million) will serve to bridge this funding gap (especially given that no inflationary increase has been built into the following financial years in the MTEF). To respond to the ever-increasing demand for TIA funding, TIA must continue to identify and secure alternative sources of funding and revenue. Given the excellent track record of being able to deploy funds as supported by the current year's performance, TIA is well poised to deploy funds effectively in the NSI and to continue to bolster its funding capacity through leveraging its partnerships effectively.

Mr Ismail Abdoola
Chief Financial Officer

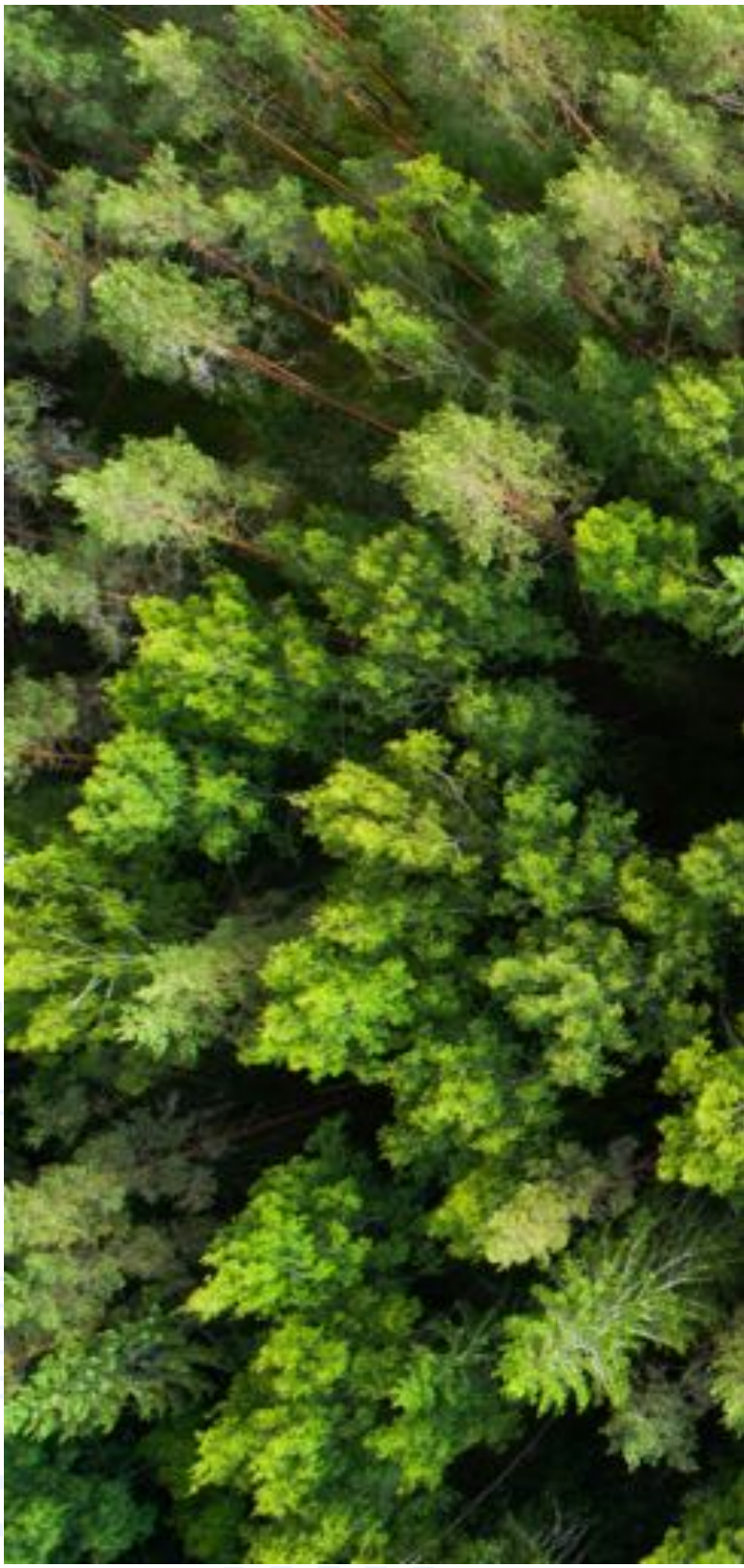
7. STATEMENT OF RESPONSIBILITY AND CONFIRMATION OF THE ACCURACY OF THE ANNUAL REPORT

To the best of my knowledge and belief, I confirm the following:

- All information and amounts disclosed in the annual report are consistent with the Annual Financial Statements (AFS) audited by the Auditor-General.
- The annual report is complete, accurate, and is free from any omissions.
- The annual report has been prepared in accordance with the guidelines on the annual report as issued by National Treasury.
- The AFS (Part E) have been prepared in accordance with Generally Recognised Accounting Practice (GRAP) standards applicable to the public entity.
- The accounting authority is responsible for the preparation of the AFS and for the judgements made in this information.
- The accounting authority is responsible for establishing and implementing a system of internal control that has been designed to provide reasonable assurance as to the integrity and reliability of the performance information, the human resources information, and the AFS.
- The external auditors are engaged to express an independent opinion on the AFS.
- In our opinion, the annual report fairly reflects the operations, the performance information, the human resources information, and the financial affairs of the entity for the financial year ended 31 March 2022.

Mr Patrick Krappie
Acting Chief Executive Officer
29 July 2022

Ms Matsi Modise
Board Chairperson
29 July 2022



8. STRATEGIC OVERVIEW

TIA's 2020-2025 Strategic Plan seeks to position the Agency within the NSI through the pursuit of three outcomes:

Outcome 1: Commercialised innovations

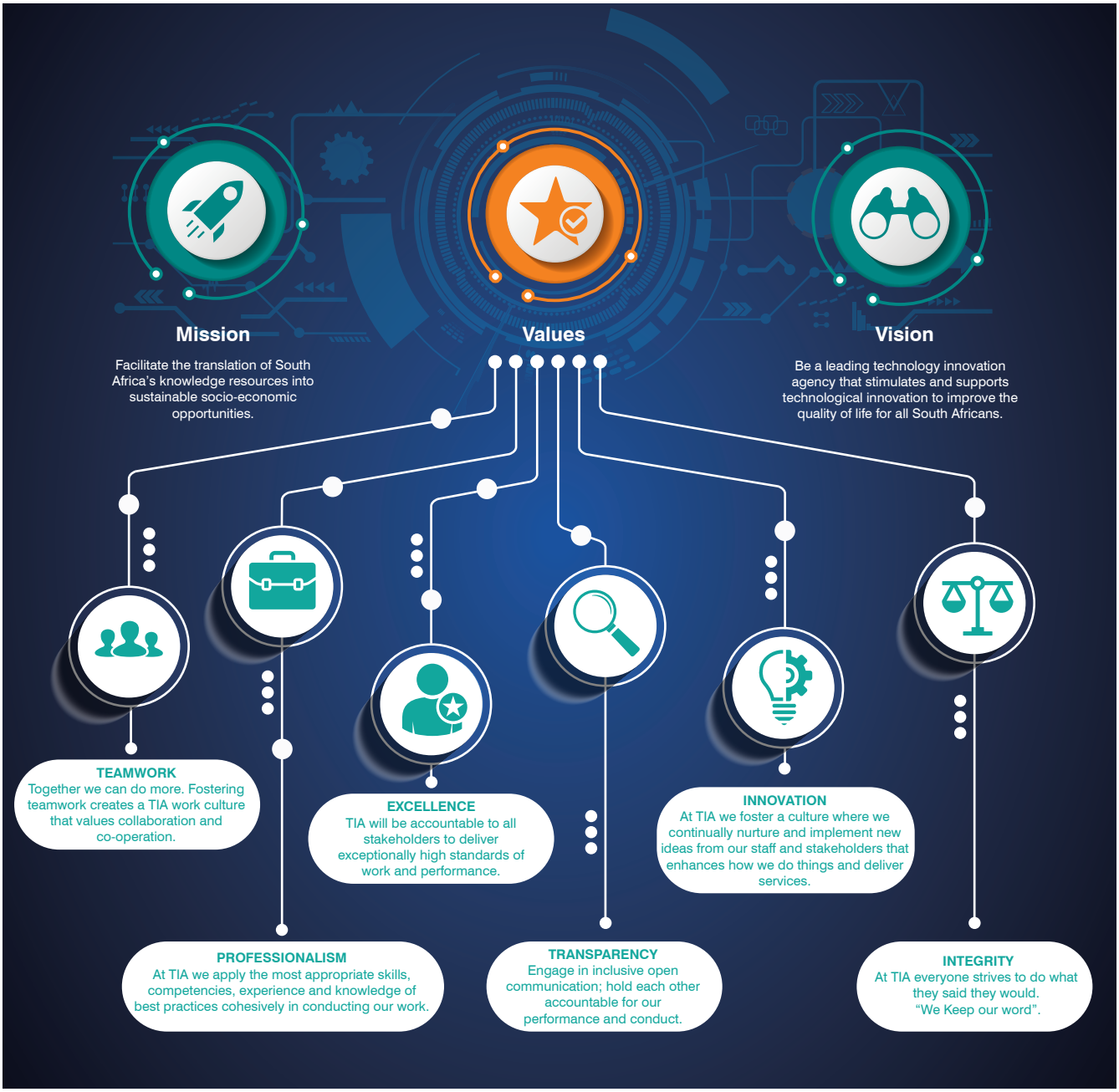
TIA seeks to direct a greater proportion of its resources towards the translation and commercialisation of publicly financed intellectual property emanating from universities and science councils.

Outcome 2: Delivering on the Bio-economy Strategy

TIA is the main implementer of the Bio-economy Strategy, through which South Africa's unique biological resources, historical biotechnology investments, and bio-based capabilities are used for greater socio-economic value.

Outcome 3: SMMEs supported through strategically informed and regionally distributed Technology Stations

TIA aims to foster an enabling environment for innovation, with a specific focus on driving transformation and ensuring inclusion through the provision of SET and enterprise development services.



9. LEGISLATIVE AND OTHER MANDATES

TIA's mandate is derived from the provisions of the TIA Act (No. 26 of 2008)[1], which establishes TIA as an agency to promote the development and exploitation, in the public interest, of discoveries, inventions, innovations, and improvements. TIA's objective is to support the state in stimulating and intensifying technological innovation that improves economic growth and the quality of life of all South Africans.

The National Development Plan (NDP) seeks to eliminate poverty and reduce inequality by 2030 through "drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society".

The NDP recognises that developments in science, technology and innovation (STI) fundamentally alter the way people live, connect, communicate, and transact. It identifies STI as the main drivers of equitable economic growth and development, job creation, and socio-economic reform; and it emphasises that the role of STI is key to improving health systems, education, and infrastructure. The NDP states that "South Africa's competitiveness will rely on national systems of innovation permeating the culture of business and society. Innovation and learning must become part of our culture".

TIA plays a critical role in supporting the realisation of the NDP's vision through funding and de-risking technological innovation and also through encouraging the commercialisation of mature technologies. Another critical role for TIA is to support the process of knowledge utilisation, and providing SET support to SMMEs and co-operatives, particularly to women, youths, and people with disabilities.

The 2020/21–2024/25 Medium-Term Strategic Framework (MTSF) is the prevailing overarching government framework for the socio-economic transformation of South Africa (SA). It identifies technological innovation as one of the critical policy areas required to speed up growth and transform the economy to create decent work and sustainable livelihoods.

TIA has aligned its initiatives and contributes to the following four outcomes:

- Outcome two: A long and healthy life for all South Africans.
- Outcome four: Decent employment through inclusive economic growth.
- Outcome five: A skilled and capable workforce to support an inclusive growth path.
- Outcome ten: Protect and enhance our environmental assets and natural resources.

The Economic Reconstruction and Recovery Plan of October 2020 aims to restore SA's economy through stimulating equitable and inclusive growth following the impact of the COVID-19 pandemic. The objectives of the plan are to create jobs through infrastructure investment and mass employment programmes, reindustrialise the economy with a focus on small businesses, speed up economic reforms to unlock investment and growth, fight crime and corruption, and improve the state's capability. Associated with the plan is Operation Vulindlela, a government-wide approach which seeks to accelerate the process of economic reforms in support of economic recovery and to redress the underlying causes of low economic growth and high unemployment.

The plan has several priority areas or pillars, as follows:

- Energy security
- An industrial base to create jobs
- A mass public employment programme
- Infrastructure development
- Macro-economic interventions
- The green economy
- Agriculture and food security
- Reviving the tourism sector
- Gender equality and the economic inclusion of women and youths.

TIA did not receive any additional budget for interventions specifically to respond to the COVID-19 pandemic. This notwithstanding, TIA was extensively involved in responding to the pandemic in the year under review: the particulars of TIA's COVID-19 response are to be found across Section 14: Divisional Performance.

The White Paper on Science, Technology and Innovation was adopted by the Cabinet in March 2019. It signalled significant policy shifts for STI to promote transformation and inclusivity and underscore the need for stronger partnerships, linkages, and co-ordination in the NSI. This includes strengthening the culture of innovation in government and society; developing human capabilities; improving policy coherence and more effective budget and programme co-ordination in the NSI; implementing monitoring and evaluation systems; creating a more enabling environment that improves innovation performance; developing local innovation ecosystems; increasing investment in technology-based SMMEs; and lending support to grassroots and social innovation projects. There is a focus on the fields of food security, energy, poverty alleviation, and healthcare.

The DSI's mandate encompasses the generation and exploitation of knowledge for socio-economic development in SA. In this knowledge-based economy, TIA's role is to support inclusive economic growth through technological innovation, improving the competitiveness of industry (particularly SMMEs), and focusing on the empowerment of youths, women, and people with disabilities.

[1] As amended by the Science and Technology Laws Amendment Act (No. 7 of 2014) and the Science and Technology Laws Amendment Act (No. 9 of 2020), with effect from 1 April 2021.

DSI's Decadal Plan serves as the implementation plan for the White Paper on Science, Technology and Innovation. Its direction and content were approved as a Master Plan of government by the Cabinet in March 2021. The Decadal Plan identifies the following nine priorities, framed at the level of societal grand challenges:

- The circular economy.
- Education for the future.
- Sustainable energy.
- The future of society.
- Health innovation.
- High-tech industrialisation.
- Information and communication technologies (ICTs) and smart systems.
- Nutrition security.
- Water security.

The Decadal Plan seeks to achieve five system goals:

- Support an environment which is more enabling for innovation, particularly for translating research outputs into new products and services .
- Expand and improve human capabilities.
- Expand and transform the country's research system.
- Build a more inclusive and co-ordinated NSI.
- Increase funding for research, development, and innovation and make such funding processes more efficient.

It is incumbent on TIA to transition towards greater alignment with these nine priority areas, particularly with a mission-oriented and inclusive approach to innovation as envisaged by the DSI. Given the proposed implementation dimensions of the Decadal Plan, TIA's role is key in terms of:

- Revitalising and modernising key sectors of the economy through improving economic competitiveness and productivity: agriculture, manufacturing, and mining.

- Leveraging off the circular economy and the digital economy as new sources of growth.

- Innovation in support of health, specifically through the optimisation of health systems, improving the quality of healthcare, and the digitisation of healthcare systems.

- Energy-sector innovation in support of decarbonising the economy.

The Bio-economy Strategy provides a high-level framework to guide bioscience research and innovation investments and actions by stakeholders in the South African NSI. It seeks to use SA's bio-based resources to become a significant contributor to the country's economy by 2030 through the creation and growth of biotechnology-based industries. In turn, these new industries will generate and develop bio-based services, products, and innovations in which new and existing companies will provide and use such solutions. Additional bio-innovation would support social development and environmental protection. This is crucial to job creation, contributing to gross domestic product (GDP), exports, the building of industries and responding to market failures, and the harnessing of human capital, financial resources, infrastructure, and knowledge. TIA is one of the primary implementation actors of the Bio-economy Strategy (which now includes IKS).

The District Development Model aims to improve service delivery through synchronised planning at the national, provincial, and local government levels, thereby addressing challenges and unlocking blockages. It seeks to enable partnerships with civil society – including communities, private industry, and labour – at a district level countrywide in the development of SA's municipal districts and metros. The role of government under the model is to ensure greater alignment between urban and rural development (with deliberate emphasis on local economic development). TIA is a member of the DSI Entities District Development Model Coordinating Committee.

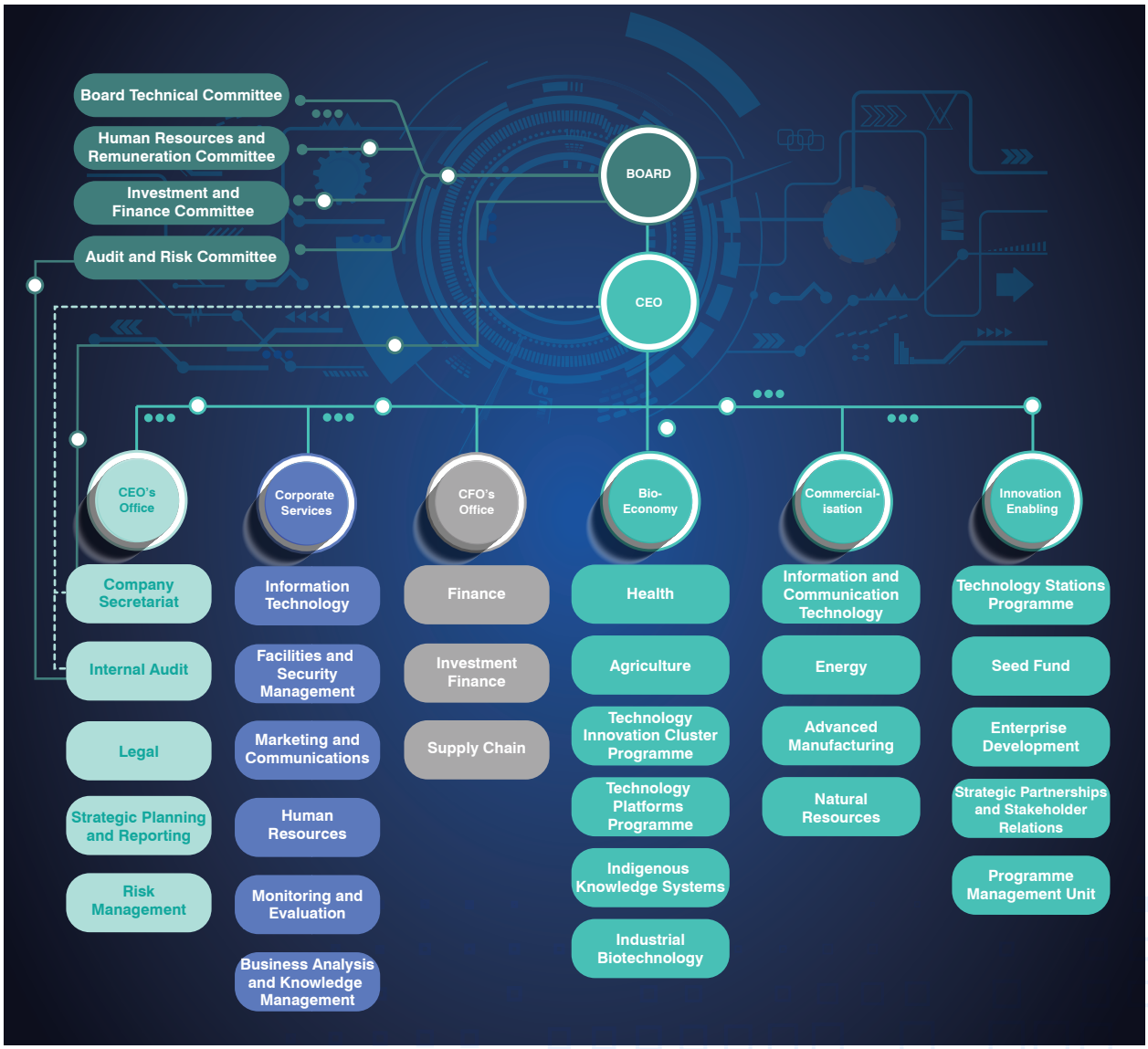
The United Nations' Sustainable Development Goals entail ending poverty and hunger globally; combatting inequality within and among countries; building peaceful, just, and inclusive societies; protecting human rights; promoting gender equality and the empowerment of women and girls; and ensuring the lasting protection of the planet and its natural resources. Countries committed to the goals aim to create conditions for sustainable, inclusive, and sustained economic growth, shared prosperity, and decent work for all.

TIA provides SET support to SMMEs; particularly those that are black-owned, black women-owned, and youth-owned. TIA also supports grassroots innovators in vulnerable and marginalised communities. These and other efforts help to contribute to achieving the Sustainable Development Goals.

The African Union's Agenda 2063 is a long-term, people-centred strategic framework for the socio-economic transformation of Africa. Efforts are underpinned by STI as multifunctional tools and enablers for achieving development goals on the continent. Agenda 2063 calls for diversifying sources of growth for Africa's economic performance and, in the long term, raising large sections of the continent's population out of poverty. The strategic framework also fosters social transformation, economic industrialisation, and entrepreneurship.

TIA plays a key facilitation role through its collaboration with research and innovation institutions across the continent. It strives to implement joint technology development programmes and to provide technical competence and entrepreneurial capacity development, in these ways increasing the application of knowledge outputs to stimulating socio-economic transformation.

10. ORGANISATIONAL STRUCTURE



PART B

Performance Information

11. PERFORMANCE OVERVIEW

11.1 SERVICE DELIVERY ENVIRONMENT

TIA recorded a year-end output performance achievement of 86%, representing a total of 19 targets achieved out of 22 output indicator targets for the year. This is a favourable achievement compared to the Agency's historical performance, as shown in Figure 1. In some instances, TIA over-performed significantly beyond planned performance targets. These results were achieved against the backdrop of a challenging economic environment characterised by low growth and a constrained fiscal environment.

Figure 1: TIA's historical performance against its output indicator targets

The 2021/22 financial year also saw a continuation of the COVID-19 pandemic, a period characterised by Delta and Omicron variants, albeit with fewer restrictions on economic activity and the movement of citizens. TIA's operations were thus not hampered to the extent experienced in the previous financial year under lockdown level five. However, both the State of the Nation Address by the President and the Budget Speech by the Minister of Finance underscored an economy struggling to recover and faced with a weakening fiscal position. Indeed, while the South African economy started to recover in 2021 after experiencing negative economic growth in 2020, such growth was largely jobless, with the World Bank estimating that 1.9 million fewer people were employed at the end of 2021 (compared to the situation before the pandemic struck SA in March 2020).

The year under review represented the end of the second financial year in terms of implementing TIA's 2020–2025 Strategic Plan. These two financial years provided invaluable lessons for TIA regarding improving its organisational performance in the balance of the strategic period. The institutional review of TIA (initiated at the behest of the Minister of Higher Education, Science and Innovation) also brought with it an important period of deeper reflection in terms of how to position the Agency strategically in the future.

Through its mandate, TIA strives to ensure that innovations derived from scientific research and technology development make more of an impact on society and the economy and preserve the environment. TIA also plays a key role in the NSI by broadening the benefits of innovation to historically disadvantaged individuals (HDIs) and groups through directed transformation and inclusion efforts.

11.2 ORGANISATIONAL ENVIRONMENT

11.2.1 INVESTMENT APPROVAL TURNAROUND TIMES

TIA has recognised the impact of long investment turnaround times which have resulted in displeased stakeholders. Therefore, it is crucial to resolve the turnaround time issue so that TIA can regain the trust of customers and the shareholder.

Addressing the issue of turnaround times will assist in ensuring that TIA reduces its pipeline to a more manageable size where applicants can receive quicker feedback concerning their funding applications. Various initiatives are under way to reduce the time it takes to approve funding applications. These include the following:

- Redesigning processes and educating potential applicants on TIA's mandate, which determines what TIA can and cannot fund. A benchmark study will inform the turnaround time which TIA should be measured against. This will be communicated to all applicants.
- TIA also established a panel of experts to complement internal capacity. These experts will provide advice on technical and commercial due diligence as well as on matters related to Intellectual Property (IP).
- Assessment of business systems and provision of integrated process optimisation capabilities for seamless information flow across various systems. The goal is to integrate TIA's information technology systems to speed up information flows and reduce operational costs. The to-be-implemented Enterprise Resource System will not only enhance operational efficiency, but will also enable TIA to track and report performance against its output indicators in real time.

11.2.2 OPERATIONAL STRUCTURE

The Board-approved structure enables the agency to progress towards a leaner, more agile organisation that is properly capacitated to deliver effectively on three priority areas of need in the NSI. From a governance perspective, the Board approved the establishment of the Board Technical Committee to serve in an advisory capacity, in addition to the three existing Board sub-committees. This committee could, however, not be activated during 2021/22 due to the limited number of Board members and restrictions on the number of committees each Board member may serve on.

11.2.3 OPERATING ENVIRONMENT

The TIA structure is capacitated with well-educated staff who have qualifications and experience covering a broad range, including science, innovation, engineering, finance, investment, legal, and business management. However, current economic conditions resulted in financial resources too limited to fully capacitate the structure. In response, TIA appointed staff in acting capacities and seconded staff to ensure key areas are sufficiently capacitated to deliver on the TIA mandate.

To improve operational efficiency and reduce turnaround times, TIA recognised the need for all its business systems to be assessed and to provide integrated process optimisation

capabilities for seamless information flow across various systems. The goal is to integrate TIA's information technology systems to speed up information flows and reduce operational costs. The Enterprise Resource System will not only enhance operational efficiency but will also enable TIA to track and report performance against its output indicators in real time.

11.2.4 CUSTOMER SERVICE AND QUALITY MANAGEMENT

To keep track of its customers and ensure that each customer receives the appropriate attention and service needed, the organisation implemented a fully fledged Customer Service Centre. The Customer Service Centre serves as a primary customer interface and single point of contact where customer relationships are initiated, retained, and grown. TIA implemented certified training programmes for its employees regarding customer service management.

As a discipline, the Quality Management System provides a platform for TIA to integrate its policies, procedures, processes, systems, and information used by the Agency to enable better and more consistent service delivery that meets and exceeds customers' needs and expectations. TIA has embraced this principle to enhance its operational efficiency, effectiveness, and service excellence. The Agency achieved the ISO 9001:2015 certification in 2018 and has since been successful in retaining this certification.

11.2.5 OFFICE FACILITIES AND REMOTE WORKING

Since the announcement of the COVID-19 pandemic and the lockdown measures implemented by the South African Government from 26 March 2020, TIA staff were able to adapt to remote working conditions very quickly, with minimal interruptions. TIA staff can also be more productive as a result of spending less time commuting. TIA is therefore working on adopting a hybrid model where staff will alternate between working remotely and working from office as the need arises. This will lead to operational cost savings and increased staff satisfaction.

11.3 KEY POLICY DEVELOPMENTS AND LEGISLATIVE CHANGES

Policymakers remain concerned at SA's persistent triple challenges of poverty, inequality, and unemployment in the period under review. The National Annual Strategic Plan 2022/23 highlights the fact that insufficient progress has been made towards achieving the NDP targets of zero poverty and reduced inequality by 2030. Poverty remains high at 39.8% of the population (using the lower-bound poverty line), and inequality also remains high at 0.68 (as per income Gini coefficient). Unemployment is also high at 34.4% (using the official definition), with women and youths being worse off in terms of access to economic opportunities. Indeed, the COVID-19 pandemic required the government to redouble its efforts towards alleviating the impact of the pandemic by implementing the 2020 Economic Reconstruction and Recovery Plan.

The proposed Startup Act is led by representatives of the SA entrepreneurship ecosystem, including AfricArena, Digital Collective Africa, Endeavor South Africa, i4Policy, Loudhailer, the Southern African Venture Capital and Private Equity Association, Silicon Cape, SiMODiSA, and Wesgro. This Act ostensibly seeks to support the growth and innovation of South African entrepreneurs, particularly among youths. Amongst others, the Act proposes relaxing Broad-Based Black Economic Empowerment (B-BBEE) requirements for qualifying start-ups in terms of procurement and supply-chain grading, a more flexible employment regime, and "granting amnesty, maximise the portability, commercialisation and investment into South African intellectual property".[2] This will enable South African IP to be offshored. If enacted, portions of the Startup Act could have significant implications for TIA, particularly concerning the commercialisation of publicly funded IP.

Significant steps towards implementing the policy intents of the White Paper on Science, Technology and Innovation and the associated Decadal Plan took place in the period under review. The Decadal Plan was approved as a Master Plan of government by the Cabinet in March 2021 in terms of direction and content. Furthermore, the Cabinet directed the DSI to undertake further consultation with social partners and other government departments to ensure effective implementation of the Decadal Plan. The Decadal Plan is also seen as a key strategy for inclusive innovation under government's Economic Reconstruction and Recovery Plan.

The Minister of Higher Education, Science and Innovation had engaged his Cabinet counterparts concerning the establishment of an Inter-ministerial Committee on Science, Technology and Innovation to drive innovation in a joint government approach, co-fund the priorities of the Decadal Plan, and develop an Innovation Compact for SA.

Budget co-ordination to ensure collective funding and implementation across departmental boundaries is crucial. Furthermore, an STI budget co-ordination process is important to raise the allocation of funds for STI. Accordingly, a task team comprising senior officials from the National Treasury and the DSI had been exploring the integration of an STI budget co-ordination mechanism into government budgeting via the MTEF. National Treasury has reportedly agreed to the principle of STI budget co-ordination such that public funding for STI would be distributed across departmental boundaries based on expert analysis.

The purpose of the Innovation Compact is multi-faceted. First, it seeks to achieve policy coherence and certainty in relation to innovation in order to facilitate business and foreign investment in SA. Secondly, it seeks to synergise rather than duplicate initiatives and incentives, in this way reducing the wastage of resources and optimising the contribution of innovation to addressing SA's priorities. Thirdly, it aims to ensure commitment from the relevant NSI actors to pool their resources and work together to enhance innovation performance.

The proposed priorities of such an Innovation Compact are as follows:

- Targeting education and skills to support innovation.
- Arresting IP leakage from publicly funded research and development (R&D) through increased support for commercialisation.
- Engaging in the public procurement of locally developed technologies.
- Improving the capabilities across government to support innovation and increasing the spatial footprint of innovation in SA in accordance with the District Development Model.
- Developing an artificial intelligence (AI) strategy and ethics framework.

The results of the Ministerial Review of TIA had not been communicated to TIA by the end of the year under review. The outcomes of the Ministerial Review process (including the recommendations resulting from the National Treasury Spending Review of TIA and TIA's response to the collective recommendations) may result in material changes to TIA's structure and operations from 2022/23 onwards. This notwithstanding, TIA's planning process for 2021/22 had begun to incorporate the aforementioned national and STI-specific priorities and imperatives insofar as these are possible and practical.

[2] Source: www.startupact.co.za

12. PROGRESS TOWARDS ACHIEVING INSTITUTIONAL IMPACTS AND OUTCOMES

TIA's 2020–2025 Strategic Plan seeks to improve the quality of life of all South Africans through innovation. To position the activities of TIA within the framework of the MTSF, the NDP, and other DSI priorities, TIA's 2020–2025 Strategic Plan and its 2021/22 APP were structured around three outcomes which seek to direct the initiatives of the Agency during this period.

Outcome 1: Commercialised Innovations contributes directly to TIA's core mandate, which emphasises supporting the development and exploitation of technological innovations by translating knowledge into market-ready innovations. The planned focus for TIA's five-year strategic cycle is to support advancements in revitalisation and transformation of key industry sectors of the economy and new-venture creation through commercialising the maturing TIA investment portfolio. The conversion of these investments in technological innovations towards the creation of new industrial ventures will contribute towards dealing SA's triple challenges of poverty, unemployment, and inequality. The efforts and rigour in full investment life-cycle management has unearthed possible redemption opportunities and rising royalty income in the commercialisation division. This affirms the true potential of these technologies to contribute meaningful economic transformation and realise equitable acquisitions that will grow the financial position of the Agency. In doing so, the Agency will be better placed to service its mandate and foster the transformation agenda in collaboration with B-BBEE candidates identified with the support of the Black Business Council.

Outcome 2: Delivering on the Bio-economy Strategy gives effect to TIA's implementation of the Bio-economy Strategy which seeks to support the translation of SA's knowledge resources into sustainable bio-based solutions that respond to societal challenges while contributing to sustainable economic growth. This outcome will also contribute to increased productivity across the four sectors identified in the strategy: agriculture, health, industry, environment, and indigenous knowledge-based innovation.

Through **Outcome 3:** SMMEs supported through strategically informed and regionally distributed technology stations. TIA aims to increase access to SET knowledge, expertise, and high-end equipment in technology innovation, process improvements, and product development to innovators and SMMEs to enable them to grow and become more competitive. The Technology Stations Programme (TSP) entails partnering with other role-players in the NSI and investing in technological infrastructure. The TSP and other similar initiatives driven by TIA are closely aligned with relevant industrial sectors to promote innovation-led industrialisation, localisation, and the promotion of exports.

Through these three outcomes, TIA responds primarily to Priority 2 (economic transformation and job creation) of government's 2019-2024 MTSF, but also Priority 3 (education, skills, and health).

TIA's performance against its three outcomes is presented in Table 1.

Table 1: TIA's performance in 2021/22 against its three outcomes and associated outcome indicators

Outcome	Outcome indicator	Outcome definition	Baseline	Planned 5 -year target & disaggregation of beneficiaries	2020/21 perform-ance	2021/22 performance	Cumulative achievement & cumulative target	Comments on 2021/22 performance
1. Commercialised innovations	1.1 Number of technologies commercialised	Number of technological innovations that have been introduced into the market for social benefit or commercial gain, directly or indirectly (prod-ucts, processes or services)	77	175 Women: 30% Youth: 20% People with disabili-ties: 10%	26[3,4] against a target of nine	49 against a target of 31, of which 28 was for women-owned businesses (57%), 12 youth-owned businesses (24%) and 1 owned by a person with a disability (2%)	75 against a target of 40	The annual target was exceeded with key deals closed between research institutions and the private sector in terms of license agree-ments as opposed to assignments as a result of the favourable regu-latory regime towards IP transactions. The mea-sure continues to be at the centre of economic development and new venture creation.
2. Delivering on the Bio-economy Strategy	2.1 Number of successfully demonstrated bio-based tech-nologies	Bio-based technologies, products or services that have reached demonstration stage in agri-culture, health, industrial biotechnolo-gy, IKS and other bio-based domains	-	75 Women: 30% Youth: 20% People with disabili-ties: 10%	37 against a target of nine, of which five was for wom-en-owned businesses (14%), five for youth-owned businesses (14%) and one owned by a person with a dis-ability (3%)	36 against a target of 12, of which 27 was for women-owned businesses (75%), 23 youth-owned businesses (64%) and 0 owned by a person with a disability (0%)	73 against a target of 21	The continued success towards meeting this target is as a result of in-creased deliberate and systematic extraction of data that supports this target from investees. This exercise involved quarterly follow-up per investee, as new information became available. TIA has also sought to drive delivery against this target through the agency's SFP.
	2.2 Number of bio-based entrepreneurs and organisa-tions accessing high-end SET services	Bio-based entrepreneurs and organisa-tions accessing high-end SET support for the purposes of developing innovative, bio-based products or services through the financial or non-financial support of the Technology Platforms network	-	600 Women: 45% Youth: 40% People with disabili-ties: 3%	165[3, 5] against a target of 105	45[3] against a target of 110	210 against a target of 215	Notwithstanding un-der-performing against this target in 2021/22, the fve-year target re-mains achievable as the number of clients within the higher education sector to be supported is expected to increase substantially from 2022/23 onwards.
3. SMMEs supported through strategically informed and regionally distributed Technology Stations	3.1 Number of SMMEs access-ing SET services	SMMEs that access SET support for the purposes of developing innovative prod-ucts or services through the financial or non-financial support of the Technology Stations network	10,530	15,750 Women: 45% Youth: 40% People with disabili-ties: 3%	1,990 against a target of 2,390 of which 709 were women (36%), 1,006 youth (51%) and 11 people with disabilities (0.6%)	3,167 against a target of 3,150 of which 1,435 were women (45%), 1,857 youth (59%) and 27 people with a disability (0.9%)	5,157 against a target of 5,540	TIA met its target for the year mostly due to contributions from TSP.

Legend

Performance fully met or exceeded **Performance not acceptable**

[3] Some data concerning disaggregation of beneficiaries in 2020/21 and 2021/22 are not available due to insufficient evidence records needed to validate evidence submitted, and due to evidence collection systems within TIA and at its partners not requiring the capturing of such data. Systems will be improved such that disaggregation of beneficia-ry data are collected and reported on for 2022/23.

[4] The performance against outcome indicator 1.1 was restated from 8 as reported in the 2020/21 Annual Report due to additional evidence being collected.

[5] In the 2020/21 Annual Report no data were reported due to data collection systems not being in place at the time. The estimated performance for 2020/21 was constructed based on historical reports submitted and engagements with individual Technology Platforms. Accordingly, the estimated performance for 2020/21 is not based on actual evidence submitted, unlike for 2021/22 when performance data are supported with evidence. TIA will continue engaging with Technology Platforms to improve/update their systems to be able to obtain the required performance data from 2022/23.

13. INSTITUTIONAL OUTPUT PERFORMANCE

TIA has 22[6] output indicators for the year under review based on its 2021/22 APP. TIA achieved 19 of these 22 targets for the year, representing a performance of 86% compared to 90% in 2020/21.

Table 2, Table 3, and Table 4 present the Agency's performance against its three outcomes for the Agency's 2021/22 APP targets. Furthermore, Table 5 presents TIA's performance against its administration-related targets.

Table 2: TIA's performance in 2021/22 against Outcome 1: Commercialised innovations

Output *(Output Indicator)*	Audited Performance 2019/20	Audited Performance 2020/21	Planned Target 2021/22	Actual Achievement 2021/22	Deviation for 2021/22	Comments
1.1 Technologies licensed or assigned *(Number of licensed or assigned technologies)*	-	6	9	10	+1	The annual target was exceeded under this metric with key deals closed between research institutions and the private sector in terms of licenses. TIA continues to observe a disproportionately larger percentage of licenses as opposed to assignments due to the favourable regulatory regime towards such IP transactions.
1.2 Joint collaborations between TIA and academia, TIA and industry, or between academia and industry[7] *(Number of projects involving industry in execution)*	-	29	15	34	+19	Targets have been exceeded under this metric for the year. This is in accordance with established 'triple helix' principles under which the likelihood of successful innovation increases when industry participates in R&D.
1.3 Technologies diffused for inclusive development *(Number of successfully diffused technologies)*	-	5	9	12	+3	TIA exceeded its target for the year due to successes achieved through implementing the Innovation for Inclusive Development (IID) programme on behalf of the DSI.
1.4 Products launched *(Number of products launched)*	-	21	22	37	+15	TIA significantly over-achieved against its target for the year due to the contributions of the DSI's IID programme in addition to products launched based on conventional R&D-based technological innovation.
1.5 Leveraged funds (*co-investment with other parties, financial and/or follow-on funding)* *(Total Rand value leveraged through signed agreements entered into with other parties)*	-	R1.37b	R239m	R746.5m	+R507.5m	In 2021/22 this metric was narrowly defined in a manner that limited reporting to cash contributions to render achievements more tangible. In the past, in-kind and other non-direct monetary contributions were considered. Despite this change, TIA was still able to surpass its target for the year by a substantial margin.

Legend

Performance fully met or exceeded

[6] This excludes the output indicators which have a zero target (or no target) for the year.

[7] The 2021/22 APP incorrectly states this output indicator as "Joint collaborations between academia and industry, TIA and industry, or between academia and industry".

Table 3: TIA's performance in 2021/22 against Outcome 2: Delivering on the Bio-economy Strategy

Output *(Output Indicator)*	Audited Performance 2019/20	Audited Performance 2020/21	Planned Target 2021/22	Actual Achievement 2021/22	Deviation for 2021/22	Comments
2.1 Bio-based technologies developed *(Number of successfully demonstrated bio-based technologies)*	-	37	15	36	+21	TIA significantly overachieved against this target in 2021/22 due to successfully implementing the DSI's Bio-economy Strategy; particularly due to contributions from the Industrial Biotechnology, Agriculture, and Health portfolios.
2.2 Existing Technology Platforms managed and supported *(Number of existing Technology Platforms that are operational and functional)*	-	7	8	8	0	All eight TIA-funded Technology Platforms were deemed functional and operational as planned. This was based on the combined analyses of their technology development and commercialisation support activities and capacity building initiatives, as well as the existence of appropriate governance systems.
2.3 New Technology Platforms established and supported *(Number of new Technology Platforms in targeted regions)*	-	0	1	1	0	The Precision Tree Breeding Platform was established in 2021/22 as planned.
2.4 Technology Innovation Clusters managed and supported *(Number of existing Technology Innovation Clusters that are operational and functional)*	-	5	8	7	-1	TIA did not achieve this target due to not concluding funding agreements and associated business plans and funding proposals with the Dairy Genomics Programme and the Beef Genomics Programme. In the former instance, the industry association declined to commit to transformation targets. In the latter instance, several matters remained unresolved despite several engagements with the respective science council. TIA remains committed to resolving these issues to realise further value from its historical expenditure in these two clusters.

Legend

Performance fully met or exceeded

Performance not acceptable

Table 4: TIA's performance in 2021/22 against Outcome 3: SMMEs supported through strategically informed and regionally distributed Technology Stations

Output *(Output Indicator)*	Audited Performance 2019/20	Audited Performance 2020/21	Planned Target 2021/22	Actual Achievement 2021/22	Deviation for 2021/22	Comments
3.1 Existing Technology Stations managed and supported *(Number of existing Technology Stations providing science, engineering and technology support that are operational and functional)*	-	16	18	18	0	All 18 Technology Stations were deemed operational and functional in the period under review.
3.2 New centres established and supported *(Number of new technology transfer centres providing science, engineering and technology support in targeted regions)*	-	1	0	3	+3	Three new Living Labs were established, namely the MafiHub Living Lab, the Propella Township Virtual and Mobile Pop-Up Techno Garage Makerspace Lab, and the Northern Cape Development Ecosystem.
3.3 SET support provided to SMMEs *(Number of SMMEs and cooperatives receiving SET support)*	3,269	1,990	3,500	3,167	–333	TIA's annual performance is 90% of the annual target of 3,500 which is deemed acceptable according to the technical indicator description for this output indicator per TIA's 2021/22 APP.
3.4 High level human capital development for competitiveness and new industry development *(Number of honours, masters, post-doctoral students admitted within the TSs activities)*	-	125[8]	95	96	+1	TIA exceeded its annual target.
3.5 Knowledge and innovation products produced *(Number of patents, publication outputs and knowledge based products (i.e., prototypes, technology demonstrators and technology assistance packages) produced through Office of Technology Transfer (OTT) disclosures as per Intellectual Property Rights from Publicly Financed Research and Development (IPR-PFRD) Regulations)*	-	137[8]	130	179	+49	TIA significantly over-achieved against its annual target due to additional knowledge-based outputs (journal publications) produced, over and above the more conventional innovation-based outputs (prototypes, technology demonstrators and technology assistance packages).

Legend

Performance fully met or exceeded | **Performance acceptable but not fully met** | **Performance excluded (zero target for the year)**

[8] Unaudited management indicator data included for comparative purposes

Table 5: TIA's performance in 2021/22 against its Administration-related output targets

Output *(Output Indicator)*	Audited Performance 2019/20	Audited Performance 2020/21	Planned Target 2021/22	Actual Achievement 2021/22	Deviation for 2021/22	Comments
A1.1 Reduced vacancy rate *(Percentage of approved funded positions filled annually)*	79%[9]	78%[9]	80% of approved funded positions filled by 31 March 2022.	92% of approved funded positions filled by 31 March 2022.	+12% points	TIA prioritised vacancies to be filled during 2021/22 due to the prevailing economic constraints. Only 19 of 41 vacancies were funded for recruitment. Recruitment for less critical positions were placed on hold pending the TIA Ministerial Review outcomes.
A1.2 Good financial governance *(Achieve an unqualified external audit)*	Unqualified external audit opinion	Unqualified external audit opinion	Achieve an unqualified external audit report for the 2020/21 financial year with no new material matters identified by 31 July 2021.	Achieved an unqualified external audit opinion for 2020/21 with no new material matters identified by 30 June 2021.	-	The statutory audit for 2020/21 was completed in Q1 and TIA's final approved AFS was submitted before the statutory deadline of 31 July 2021.
A1.3 Media and marketing initiatives to profile TIA and achievements from its investments *(Number of media platforms used to promote TIA initiatives)*	-	-	Four platforms (print, online, media and social media) to profile TIA initiatives by 31 March 2022.	Four platforms used to profile TIA initiatives by 31 March 2022.	-	-
A1.4 Improved turnaround times on investment decisions *(Improve on investment decision turnaround times)*	54 weeks[9]	32 weeks[9]	Achieve a 4-week turnaround time on investment process for funding applications <R1m by 31 March 2022. Achieve a 15-week turnaround time on investment process for funding applications R1m-R15m by 31 March 2022. Achieve a 26-week turnaround time on investment process for funding applications >R15m by 31 March 2022.	Achieved an average 18.9-week turnaround time on investment process for funding applications <R1m by 31 March 2022. Achieved an average 19.6-week turnaround time on investment process for funding applications R1m-R15m by 31 March 2022. For funding applications >R15m received in the year no decisions had been taken by 31 March 2022.	Not achieved	TIA did not meet its turnaround time targets, due to complex approval processes. These matters were attended to, and the average turnaround time was reduced to approximately 19 weeks.
A1.5(a) Support transformation initiatives through TIA Operations: Recruitment *(Recruitment initiatives which will move TIA demographics closer to the Economic Active Population (EAP))*	-	-	Recruitment initiatives which will move TIA demographics closer to the EAP by 31 March 2023.	The staff demographics gap when measured against the EAP for African males reduced from 18.74% to 16.15% and the gap for Coloured males reduced from 2.72% to 2.04% for the year.	-	TIA's current staff complement fairly represents most of the demographic categories as per the EAP (apart from African males and Coloured males). Recruitment initiatives were therefore focussed on the attraction of African males and Coloured males.
A1.5(b) Support transformation initiatives through TIA Operations: Procurement *(Support women and youth owned businesses through procurement initiatives)*	-	-	% of total procurement with Black women owned businesses: 20%; Black youth-owned businesses: 10%.	% of total procurement from: Black women-owned businesses: 27%; Black youth-owned businesses: 7.4%.	Not achieved	Despite focussed procurement initiatives, procurement from black youth-owned businesses was lower than the annual target. This was attributed to continuation of existing contracts and the specialised nature of procurement in some cases wherein suppliers with youth ownership are limited.

[9] Unaudited management indicator data included for comparative purposes

Table 5: TIA's performance in 2021/22 against its Administration-related output targets (continued)

Output *(Output Indicator)*	Audited Performance 2019/20	Audited Performance 2020/21	Planned Target 2021/22	Actual Achievement 2021/22	Deviation for 2021/22	Comments
A1.6(a) Capacitate the organisation with the required commercialisation and IP management skills: Appropriately qualified staff *(Implement initiatives to upskill resources in terms of commercialisation and IP management skills)*	-	-	Identify and implement initiatives to upskill resources in terms of commercialisation and IP management skills by 31 March 2022.	Identified and implemented initiatives to upskill resources in terms of commercialisation and IP management skills by 31 March 2022.	-	TIA was capacitated with the required commercialisation and IP management skills through on-the-job training and exposure as well as through formal training programmes.
A1.6(b) Capacitate the organisation with the required commercialisation and IP management skills: Availability of required resources *(Create a panel of service providers for in-sourcing/ outsourcing approaches)*	-	-	Create a panel of service providers for in-sourcing/ outsourcing approaches by 31 March 2022.	Created a panel of service providers for in-sourcing/ outsourcing approaches by 31 March 2022.	-	In an effort to improve its investment turnaround times, TIA established a database of external experts to complement internal resources with the assessment and due diligence investigation of project and programme proposals for funding.
A1.7 Provide learning opportunities to interns and graduates *(Number of interns/ graduates upskilled through exposure to TIA operations)*	-	18 interns[10]	7 interns	30 interns	+23 interns	TIA funded 16 interns within its Human Resources budget and hosted another 14 interns funded by the Department of Trade, Industry and Competition, Human Sciences Research Council, the Food and Beverages Manufacturing SETA, the Banking SETA, and Youth@worK..

Legend

Performance fully met or exceeded **Performance not acceptable**

[10] Unaudited management indicator data included for comparative purposes

Of the 22 annual output indicators, nine relate to support services and 13 to delivering on TIA's core mandate. TIA met most of its annual support service-related targets, including its targeted vacancy rate, recruitment measures, financial governance, media and marketing, commercialisation and IP management skills, and the provision of learning opportunities to interns and graduates. TIA's target to support black women- and black youth-owned business through its procurement spend was narrowly missed, with the black youth-owned business procurement spend falling short of the target by 2.6 percentage points.

TIA continues to implement measures to improve its investment approval turnaround time. Whilst progress has been made in this regard, efforts made to date have not fully yielded the desired results. Additional measures continue to be put in place to ensure that this target is realised in the coming year.

With regards achieving annual performance targets relating to TIA's core mandate, the Agency achieved an acceptable performance level. The Agency met or exceeded performance targets in terms of: the number of technologies licensed or assigned, technologies diffused, knowledge and innovation products produced, post-graduate students and post-doctoral fellows supported, SET support provided to SMMEs, existing Technology Platforms and Technology Stations managed and supported, and new Technology Platforms established. TIA significantly over-achieved against the annual targets for number products launched (37 against a target of 22), bio-based technologies developed (36 against a target of 15), joint collaborations (34 against a target of 15) and leveraged funds (R755.5 million against a target of R239 million). TIA also over-achieved against the number of new technology transfer centres established (three against a target of zero).

However, TIA did not achieve its annual target for supporting Technology Innovation Clusters. Contributing factors were delays in implementing partners developing business plans and declining to include transformation targets as a condition for receiving public funding. TIA will continue to engage with the respective parties and develop contingency plans where necessary to ensure continuity of support, as well as leveraging off historical investments in the respective industries.

13.1 COMMERCIALISED INNOVATIONS

For the year, TIA met or exceeded all its output indicator targets under Outcome 1: Commercialised innovations. Selected project examples contributing to TIA's output targets under the Agency's Commercialised Innovations outcome are provided below.

TECHNOLOGIES LICENSED OR ASSIGNED

In the year under review, TIA achieved a total of ten technologies either licensed or assigned against a target of nine. TIA has observed a disproportionately larger percentage of technologies licensed as opposed to technologies assigned due to the favourable regulatory regime towards such IP transactions.

IMPROVING PREVENTIVE MAINTENANCE OF HIGH-VOLTAGE POWER LINES

The Diagnostic Multi-Camera ("QUVIR") is a technology developed by the CSIR that has entered the commercialisation phase through a license arrangement with Uvirco for manufacturing and market deployment. The QUVIR is a multi-functional diagnostic camera system for fault detection on high-voltage power lines. TIA funded further development work to improve the capability of the corona discharge on high-voltage lines more objectively. This allows the camera operator to identify which of the high-voltage lines is more severely damaged and requires repairs (as opposed to functional lines).

TREATMENT OF ACID MINE DRAINAGE AND INDUSTRIAL EFFLUENT

Trailblazer Technologies (Pty) Ltd has developed the KNeW™ technology for treating industrial effluent and acid mine drainage. The KNeW™ technology has been tested on tanker loads of mine water from various mining company operations. Nesafasi Water (Pty) Ltd is a 100% black-owned water technology and water utility service company which partners with industry, government, and local communities to provide sustainable solutions to broader water security challenges.

Trailblazer has entered into a license agreement with Nesafasi Water for the pre-commercialisation of the KNeW™ technology through a demonstration plant as a solution to treating acid mine drainage from several mines.

ARTIFICIAL INTELLIGENCE VIDEO SURVEILLANCE PLATFORM

Cognitive Systems (Pty) Ltd has developed the Artificial Mind Engine for video surveillance platform which offers advanced distributed AI to continuously monitor location-aware video feeds. It was incorporated with security-related Internet of Things sensors. Cognitive Systems' platform is not limited to the security and surveillance industry segment and can be exploited in different ways, with the potential to revolutionise telemedicine and diagnostics in the health sector. This capability positions Cognitive Systems as a strategic player and pioneer in the AI industry. A license agreement has been entered into with Avylitics (Pty) Ltd for product uptake.

COMPRESSED AIR ENERGY STORAGE SYSTEM

Energy is central to nearly every major challenge and opportunity the world faces today, including poverty eradication, gender equality, adaptation to climate change, food security, health, education, sustainable cities, jobs, and transport.

A 2014 entrant under the Global CleanTech Innovation Programme-South Africa (GCIP-SA), Leaper Innovate Green Energies (Pty) Ltd was funded by TIA to develop a Compressed Air Energy Storage system to provide accessible and innovative energy-storage technology. The technology is expected to contribute to respond to the energy supply and cost challenges that large energy users face in the world today. The technology has been licensed to Queensland-based Essential Water and Energy Services (Pty) Ltd in Australia.

The compressed air energy storage system is an alternative to energy storage technologies such as batteries. The operation is based upon the use of renewable energy from solar photovoltaic systems or wind turbine energy, and also works well with grid-connected power. The system is scalable and suitable for clean intermittent sources with a long lifespan at a low cost.

To balance demand and supply backup power, the technology allows energy users to store electricity for future use. The control system is constantly monitored automatically to ensure maximum efficiency and peace of mind. The system uses no rare earth metals, and the components are recyclable, meaning that nothing goes to landfill.

The stored energy is cost-effective, clean, and reliable; with higher efficiency and cycles than batteries. The compressed air energy storage system has a zero-carbon footprint, with water being the only by-product. The technology can be scaled up to provide stored energy sources for medium and large energy users with a cost-effective, stable power supply.

> It is not an easy task to develop an innovative system in South Africa and recieive funding from the nornal financing institutions whom all are risk overse. TIA has provided the necessary funding that assisted us in developing a Compressed Air Energy Storage system. The system is cost-effective and will be demonstrated before the end of 2022.
>
> **Ms Magriet Leaper**
> Director - Leaper Innovate Green Energies (Pty) Ltd

JOINT COLLABORATIONS

TIA has exceeded its annual target for the year in accordance with established 'triple helix' principles under which the likelihood of successful innovation increases when industry participates in R&D. TIA remains enthusiastic about continuing working with principals from the research community to foster an environment conducive to industry collaborations.

JOBOX PLATFORM LINKS EMPLOYERS AND STUDENTS SEEKING WORK EXPERIENCE

Jobox is a digital platform which provides employers with access to the vetted, diverse, and affordable talent and students with work experience opportunities. The company entered into an agreement with the University of KwaZulu-Natal to enable the wide adoption of the Jobox platform. Jobox will, upon facilitation of the aforementioned promotion and engagement, undertake to provide the university's Career Development Office with a report containing data pertaining to the progress and experience of students who are enrolled in the Career Development Office and who are active users of the Jobox platform. The platform will assist university students in obtaining employment opportunities, in this way driving an increase in the number of Jobox platform users.

NEXT-GENERATION LODOX FULL-BODY X-RAY SCANNER TESTED FOR REAL-WORLD USE

The Lodox project seeks to develop a new-generation photon counting detection system based on a full-body X-ray imaging scanner capable of producing high-resolution diagnostic quality images at faster acquisition times and with a lower radiation exposure to both the patient and operator. In the year under review, the project team continued testing the Xhibit-dr machine at University of Pretoria (UP) Forensic Pathology for real-world images. In addition to this, the project also reported the expansion of its distribution networks to Turkey and Kazakhstan for the Xmplar-dr and eXero-dr machines.

LOCALISATION OF FLUCYTOSINE MANUFACTURING FOR CRYPTOCOCCAL MENINGITIS TREATMENT

The local manufacture of Fluorocytosine/Emtricitabine/Lamivudine project of Msizi Pharmaceutical Holdings ("Msizi") is supported through the Innovation Fund. The aim of the project is to localise the manufacture of flucytosine, an antifungal used in the treatment of cryptococcal meningitis and intermediate in the synthesis of two antiretroviral drugs, lamivudine and emtricitabine, via a novel continuous flow process.

Msizi has signed a collaboration agreement with Nelson Mandela University (NMU). The Flow Chemistry research group at NMU specialises in the incubation of chemical processes for potential up-scale on an industrial level through micro-fluidic and bio/chemical processing technology and is currently involved with the continuous flow process development of the synthesis of antiretroviral, tuberculosis, and anti-malaria drugs in addition to finding new and cost-effective drug delivery systems. NMU has also licensed the IP regarding lamivudine and emtricitabine which the university has patented in key jurisdictions across the world.

COLLABORATION WITH RED MEAT INDUSTRY TO IMPROVE FARMING AND PRODUCTION SYSTEMS

TIA entered into two significant collaboration initiatives with the red meat industry in the year under review, led by Red Meat Research and Development South Africa. The evaluation of smallholder pig production systems project in the Cape Metropole District of the Western Cape province received additional funding from the South African Pork Producers Organisation. A second project (precision farming of feedlot cattle) aims to enhance animal welfare, health, and production and focuses on precision livestock farming. The project is jointly funded by TIA and Sernick (Pty) Ltd.

SECOND GLOBAL JOHNSON & JOHNSON SATELLITE CENTRE FOR GLOBAL HEALTH DISCOVERY ESTABLISHED IN SOUTH AFRICA

The Drug Discovery and Development Centre (H3D) is a TIA-funded platform at UCT. The holistic platform, which pioneers world-class drug discovery research in Africa, was founded in 2010 by Prof. Kelly Chibale (a faculty member in UCT's Department of Chemistry). H3D's core business is discovering novel medicines for diseases that predominantly affect African populations, such as malaria, tuberculosis, and antibiotic-resistant microbial diseases.

In December 2021, the H3D platform entered into a partnership with Johnson & Johnson to establish H3D as a Johnson & Johnson Satellite Centre for Global Health Discovery.

The centre will receive financial support over five years from the multinational. The platform will also receive non-financial support to allow the centre to develop Africa's capacity by harnessing Africa's best scientific talent, which will also be mentored by Johnson & Johnson scientists.

The Johnson & Johnson satellite centre at H3D is the second of its kind in the world. The first such centre is hosted at the London School of Hygiene and Tropical Medicine.

The centre aims to fast-track the discovery and development of new antibiotics to limit anti-microbial resistance. Precision antibiotics to treat multi-resistant gram-negative bacteria will be the focus of the newly formed Johnson & Johnson satellite centre at H3D. Gram-negative bacteria cause infections such as pneumonia, bloodstream infections, wound or surgical site infections, and meningitis.

The success of this project would have a significant impact on the health sector. Bacterial anti-microbial resistance caused almost 1.5 million deaths in 2020. If not dealt with, bacterial anti-microbial resistance can be a possible source of future pandemics. Gram-negative bacteria are resistant to multiple drugs and are increasingly resistant to most available antibiotics. Being able to treat gram-negative bacteria means stopping the spread of untreatable bacteria, thus preventing future pandemics.

BATTERY CATHODE MATERIAL DEVELOPMENT PROJECT GAINS TRACTION

Lithium Manganese Nickel-oxide is a project of the CSIR entailing the development of a cathode material to be used in battery storage. The CSIR has entered into agreements with several companies which operate in the energy management space. The first, with Iron Energy (Pty) Ltd, will permit the two organisations to share information about batteries of various chemistries (including lithium-ion and redox flow batteries). The second, with Solzen Energy (Pty) Ltd, will facilitate quality testing of at least 200 pouch cells followed by demonstration at a client site. The third is with Energy (Pty) Ltd, a company specialising in developing, financing, building, and operating renewable energy projects in southern Africa. Collaboration with the CSIR will principally focus on knowledge exchange in relation to developments in battery storage.

TECHNOLOGIES DIFFUSED FOR INCLUSIVE DEVELOPMENT

Technological diffusion is concerned with the deployment of mature or new technologies that have primarily a social impact purpose compared with a pure profit motive, although economic gain is often a consideration for beneficiaries.

CREATION OF BLACK-OWNED INTERNET SERVICE PROVIDER TO PROVIDE INTERNET COVERAGE TO COMMUNITIES

FibrePoynt (Pty) Ltd is a spin-off company established to develop and exploit innovative technology IP created by Poynting Antennas Pty (Ltd), a division of the Poynting Group. Poynting Antennas is one of the global market leaders in the innovation, design, and manufacturing of integrated antenna solutions and products for enhanced wireless communications. Poynting, established in South Africa as a consultancy in 1990, owns a portfolio of more than 50 patents and designs widely used in the telecoms sector. The company specialises in antenna solutions for primarily wireless high-speed data applications. FibrePoynt is enabling the creation and incubation of a black-owned spin-off internet service provider to roll out a privately owned network called KasiPoynt in several communities using FibrePoynt technology. Internet coverage was provided to 120 homes in Soweto, Thembisa, and Cosmo City in the Gauteng province, Imizamo Yethu in the Western Cape province, and Klipgat in the North West province.

CAPE ALOE PROCESSING TO MAKE COSMETICS

The CSIR's Cape Aloe project aims to develop high-quality stabilised aloe ferox gels and natural preservative ingredients for the cosmetic industry in addition to the training of communities and developing SMMEs in the Eastern Cape province. Skills and technology transfer training on Cape Aloe processing and product formulation was delivered, consisting of agroprocessing technologies, Aloe ferox processing, cosmetic formulation, and product development.

PROVISION OF ANIMAL FIBRE METERS TO RURAL FARMERS

FibreLux is a portable, user-friendly, affordable, and accurate fibre diameter meter for measuring wool, mohair, and other animal fibre fineness on farms. The technology aims to assist local wool farmers in assessing the quality of wool more efficiently and quickly. TIA successfully diffused the FibreLux technology to small-scale wool farmers in the Eastern Cape province for social and economic benefit.

INNOVATIVE LOW-COST FIRE EXTINGUISHER TRIALLED IN COMMUNITY KITCHENS

The Fire Killa fire extinguisher innovation has been designed and developed as an affordable alternative to conventional pressurised fire extinguishers. An added benefit is that the product can easily be recharged (at a low cost) by the user or an appointed service agent in the community, which contributes to job creation.

The TIA-funded eNtsa Technology Station engaged with community kitchens in disadvantaged regions in the Nelson Mandela Bay Municipality to create awareness of the product and distribute Fire Killa units as a market-readiness pilot launch. This will contribute significantly to dealing with the prevalence of shack fires that South Africa has experienced in various communities.

NIXTAMALISATION POST-HARVEST TECHNOLOGY TRANSFER TO BENEFIT EMERGING MAIZE FARMERS

The Farmer Development project undertaken under the auspices of Agricultural Bio-economy Innovation Partnership Programme (ABIPP) aims to develop emerging smallholder maize farmers in the Eastern Cape province. It entails providing mentorship, training, and support to help farmers to increase yields and farm sustainably. The project specifically addresses challenges relating to the safe storage of maize through a developed post-harvest technology transfer programme (including the agro-processing technology of nixtamilization, mycotoxin training, and financial literacy training).

The process of nixtamalisation is a preparation of maize where the corn is soaked and cooked in an alkaline solution (usually limewater), washed, and then hulled. This process is applied to remove 97%–100% of the aflatoxins from mycotoxin-contaminated corn. Mycotoxins are naturally occurring toxins produced by certain moulds and fungi that can be found in food. The moulds grow on a variety of different crops and foodstuffs, including grains, cereals, apples, and coffee beans (often under warm and humid conditions). Maize is one of the major crops with a high economic risk for aflatoxin contamination, resulting in major financial losses in SA and globally.

Technology diffusion and skills transfer were undertaken with smallholder farmers and community members through training and the provision of maize threshing machines. The nixtamilisation training mentors provided an IsiXhosa manual to all trained beneficiaries (the manual also contained numerous baking and cooking recipes).

Through this project, 641 farmers have been trained in financial literacy and in nixtamalisation through various study groups in the Eastern Cape province. They are in six municipalities, namely, Ntabankulu, Mbhashe, Mhlontlo, King Sabata Dalindyebo, Intsika Yethu, and Engcobo. Of the participants trained, 80% are women (of which 20% are young women).

Smallholder farmers were also supported with ten threshing machines and training on threshing methods was provided. Threshing machines are used to separate grain crops into grain or seeds and straw. Previously, farmers threshed the maize by hand, which is labour-intensive. Machine threshing results in a higher yield and a better quality of product with minimal post-harvest losses.

PRODUCTS LAUNCHED

Introducing new products into the market is a key measure of successful commercialisation. Included in this output performance measure is the commercialisation of an innovation brought about through technological development in addition to the diffusion of existing or adapted technologies to new markets (often for social impact under focused grassroots innovation or inclusive innovation focused interventions). TIA has significantly over-performed against its target of 22 products launched, realising an achievement of 37.

EXATYPE SOFTWARE PLATFORM ENABLES SCALED-UP GENOMIC SURVEILLANCE

University of Western Cape spin-off company Hyrax Bioscience's software platform, Exatype, enables the scale-up of genomic surveillance that led to the detection of Omicron. The software platform automates the process of characterising variants through its capacity to simultaneously analyse thousands of viral DNA sequences. Exatype has been used by laboratories across Africa to analyse the equivalent of 42% of all the data generated on the African continent – more than 25,000 Sars-CoV-2 genomes. Hyrax Biosciences is funded by the UTF, a venture fund between TIA and the SA SME Fund.

COSMETIC PRODUCTS MADE FROM SODA LIGNIN LAUNCHED

LignOrganic (Pty) Ltd has launched two products targeted at the cosmetics industry. These products are Soda Lignin powder (produced through lignin extraction from waste plant biomass) and also hair conditioner and butter cream formulated using lignin as a key ingredient. The company has made sales of Soda Lignin powder to a potential strategic partner (NCS Resins (Pty) Ltd) for market testing. NCS Resins is the largest manufacturer and supplier of unsaturated polyester resins in Africa.

CONTACTABLE APP ECOSYSTEM GETS THE NOD

The Contactable data orchestration platform was adopted into the Vodacom Vodapay app. The Contactable app is an ecosystem of third-party services that allows consumers make peer-to-peer payments, transfer money, conduct online shopping, and more.

The Vodapay app relies on the Contactable's data orchestration features to conduct online issue verification and Know-Your-Client features. Contactable has also signed a value-added user agreement with Quintica SA.

LOCALLY-DEVELOPED PANIC BUTTON ENTERS DIGITAL MARKETPLACES

The Awêh Panic Button by Aizatron (Pty) Ltd is a low-cost panic button that uses Bluetooth technology to provide safety and security to individuals that may find themselves in unsafe situations. When activated, the button notifies people nearby via their cell phones that a potential victim near them is in need of help or assistance, providing them with the potential victim's location and details. This functionality enables an immediate response where the community as a whole can respond and assist the person in need. Following successful countrywide pilot trials in 2021, the Awêh Panic Button and the Awêh Guardian app are now completely developed and can be purchased via the Google Play Store, iOS AppStore, and the company's website (www.aweh-app.com).

YOUTH AND WOMEN GRASSROOTS INNOVATORS LAUNCH PRODUCTS

The Graasroots Innovation Programme consists of a rich portfolio of 15 technologies that have been introduced into the market. In the year under review, TIA showcased several youth and women entrepreneurs who had launched products into the market. These events took place in June (Youth Month) and August (Women's Month). The intention of the two events was to showcase the product innovations to invited customers and funders to raise follow-on funding and to provide enterprise development support interventions. Potential funders included selected venture capital companies as well as representatives from public sector procurement offices and other government departments and their entities that support entrepreneurs.

KLEINSKUUR GRAVEL BARREL AUTO SYPHON system is a uniquely designed, energy efficient, water wise, and cost-effective component of a high production aquaponics system. It enables big and small farmers to grow fruiting crops more efficiently.

GABRIEL is an affordable and accessible mobile tracking device that can be used as a backpack or keychain bag that enables parents, guardians, and family members to locate an individual in the event that they go missing. The tracking device unit has been installed in a waterproof backpack designed to help minors and vulnerable community members to relay information, location, and traceability to the next of kin or protection services in case of emergencies.

FOI SCIENCE develops and formulates skin care products that treat burns, scars, and wounds. The products are made from food and agricultural waste that are beneficiated into cosmetic actives.

YOGI SORGHUM JUICE is an organic alternative to drinking yoghurt made with sorghum, kefir, and a multigrain/fruits mix. The sorghum in the drink helps regulate and balance blood sugar levels, reportedly making it easier to gain or lose weight as desired. The kefir supports bone density development.

THE HONEYPOD product range are made from indigenous South African botanicals and includes specialty soaps for personal care, hair care products, and home care products. Honeypod products are 100% natural, non-toxic, mildly fragranced, hand crafted, and environmentally friendly. Raw materials are ethically sourced and there is a deliberate effort towards sustainable packaging.

OWNEDBY is a digital platform that gives each appliance and devices a unique online profile and history that permanently links it to the owner, making it possible for the owner to recover their possessions in the event they are lost or stolen. Ownedby seeks to discourage at least 10% of crime incidents that involve an appliance or device stolen during a robbery or burglary.

PREV LEAK MANHOLE COVERS is a smart hardware device that is installed on polymer manhole covers made from recycled plastic. It is tech enhanced with an ultra-sensor and sigfox network to detect and report sewage blockages on a plumber app. The solution helps to improve easy reporting, thus solving service delivery issues and promoting clean water and sanitation.

S-STORE is an online grocery shopping platform targeted at students. The platform allows students to remotely purchase their grocery essentials and have them delivered directly to their doorstep, thus freeing up time to focus on their studies.

SISANDA APP UNIVERSE is a bundle of science apps that allows learners to perform science experiments using the camera of their smartphone or tablet. It has 3D content, simulations, and game mechanics and is available as a mobile and desktop computer experiences. The offering gives students the possibility to work with virtual, realistic lab experiments which would otherwise be too expensive, time-consuming, or unsafe to perform in a school wet lab. Simultaneously, schools can cut costs on wet labs while increasing student learning and grade performance.

13.2 DELIVERING ON THE BIO-ECONOMY STRATEGY

TIA met all its output targets under Outcome two: Delivering on the Bio-economy Strategy except for the number of Technology Innovation Clusters managed and supported. The reason for this has been provided above. In the case of the Dairy Genomics Programme, TIA still recognises the value that a transformed milk industry will bring to the country. Fresh negotiations will be pursued with the industry in the next financial year. Despite several workshops with partners for the establishment of a new aquaculture cluster, and a R2 million allocation by the Agriculture Bio-economy Innovation Partnership Programme (ABIPP) Steering Committee to leverage co-funding from industry partners, this target was not met, but will be pursued to optimise on investments already made.

Selected project examples contributing to TIA's bio-based technologies developed output targets under the Agency's Delivering on the Bio-economy Strategy outcome are provided below.

BIO-BASED TECHNOLOGIES DEVELOPED

TIA is the primary implementer of South Africa's Bio-economy Strategy across the agriculture, health, industrial biotechnology, and indigenous knowledge sectors. TIA has significantly over-performed against its target of 15 bio-based technologies developed, realising an achievement of 36.

BENEFICIATION OF INSECTS FOR LIVESTOCK FEED

Khepri Innovation has developed a biological process to convert mass-produced Diptera insect species for livestock feed. The company has developed Fish bait from waste insect meal fermented in lactic acid as an alternative fish bait for carp, catfish, bream, tilapia, and bass. Khepri Innovation's circular economy approach has significant lowered their production costs due to the use of reclaimed waste products, giving the company a competitive market pricing advantage.

SELF-ALIGNING GREEN BRICKS MADE FROM NATURAL FIBRE AND WASTE FIBREGLASS

The Bio-Residue Beneficiation Value Chain Initiative project team developed a green key brick made with 90% recycled concrete products. This brick, made from alien invasive plant fibre and waste fibreglass, has the advantage of allowing unskilled users to quickly build straight walls due to its unique self-aligning and interlocking design. The Bio-Residue Beneficiation Value Chain Initiative stems from a partnership between Green Corridors and eThekwini Municipality and is being implemented at the KwaMashu Materials Beneficiation Centre.

BENEFICIATION OF PINEAPPLE WASTE PRODUCES PHARMACEUTICAL GRADE BROMELAIN

Enzyme Technologies (Pty) Ltd seeks to manufacture and distribute High-quality bromelain enzyme (a complex mixture of protease enzymes isolated and beneficiated from pineapple stems, which is an agricultural waste product). The company has developed pharmaceutical grade bromelain to customer specification using radiation technology (in partnership with Gamwave (Pty) Ltd) for the manufacture of botanical extracts, complementary medicines, and food and beverage products.

13.3 INNOVATION ENABLING AND SMME SUPPORT

TIA manages several initiatives that are intended to increase the participation of entrepreneurs, innovators, and SMMEs in technological innovation. This includes enabling access to key infrastructure capabilities (such as Technology Stations) and other innovation-enabling interventions (such as Innovation Skills Development, and Enterprise Development – the Grassroots Innovation Programme). These represent key offerings that contribute to Outcome three of TIA's 2020-2025 Strategic Plan.

Concerning Outcome three: SMMEs supported through strategically informed and regionally distributed Technology Stations, TIA met or achieved an acceptable level of performance against all four of its output indicator targets for the year. There was no target for new centres established and supported in the year, although TIA over-achieved against this metric.

13.4 TIA'S TRANSFORMATION EFFORTS

TIA is committed to transformation and inclusive innovation, and seeks to invest in a developmental fashion to support innovators in under-served provinces and invest in women, the youth, and people with disabilities. US President Joe Biden tweeted this in March 2022: "Don't tell me what you value, show me your budget, and I'll tell you what you value." With this in mind, TIA has analysed the characteristics of disbursements at the beneficiary level[11] for 2021/22, with the results presented below.

DISBURSEMENTS TO PUBLIC-FUNDED ORGANISATIONS

TIA's disbursements to organisations in the public sector (universities and science councils) is 74.5% (R280.9 million) of TIA's total payment to beneficiaries in 2021/22, compared with 25.5% (95.9 million) to non-public (private) beneficiaries. This is in line with the DSI's requirement for TIA to direct the bulk of its investment expenditure to public-funded recipients.

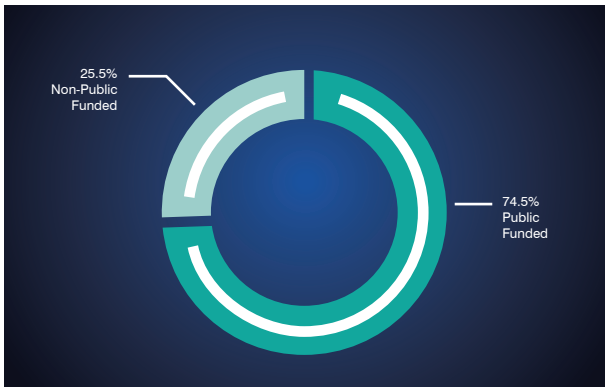


Figure 2: Disbursements to public-funded and non-public-funded organisations

GEOGRAPHIC SPREAD OF DISBURSEMENTS

In terms of geographic spread, the Gauteng, Western Cape, and KwaZulu-Natal provinces account for 38.5% (R138 million), 27.3% (R98.3 million), and 14.4% (R451.8 million) of disbursements, with the other six provinces collectively receiving the remaining 23.7% (R71.1 million). The spread is consistent with established innovation theory concerning the nature and place of where innovation tends to happen based on a multitude of favourable conditions (e.g., a talent pool, access to capital, infrastructure, proximate markets, etc.). In this regard, innovation tends to happen mostly in established economic centres where there are pre-existing vibrant knowledge and innovation ecosystems. Given that the aforementioned provinces are where the bulk of South Africa's economy resides, it is not surprising that TIA disburses predominantly to beneficiaries in these provinces.

TIA's data echoes national R&D statistics. According to the National R&D Survey for the 2019/20 year, the proportional gross expenditure on R&D in Gauteng, Western Cape, and KwaZulu-Natal provinces is 41.7%, 24.5%, and 10.5%, respectively, with the other provinces accounting for 23.3%.

While TIA's provincial expenditure largely mirrors national statistics, TIA needs to do more in terms of its developmental role to direct more of its expenditure to these other six provinces. Indeed, it is for this reason that one of TIA's new performance indicators has a target of 30% of unallocated funds to be spent in underserved provinces by the end of 2022/23.

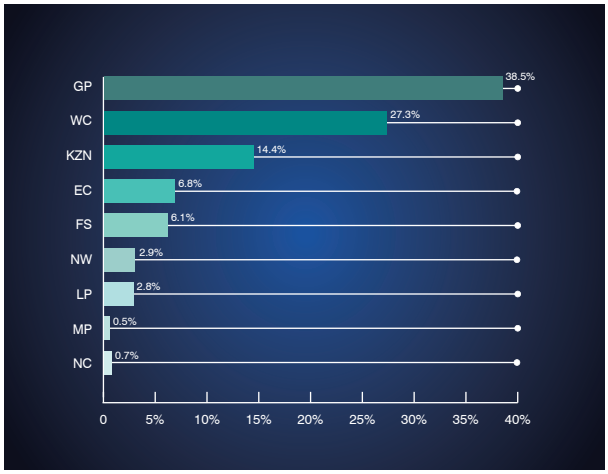


Figure 3: Geographic spread of disbursements

[11] In this context, beneficiaries of funding are the recipient or contracting party in relation to project-level funding, and the end recipient of support of programme-level funding (e.g. the Technology Stations Programme). It should be noted that the geographic spread data excludes Seed Fund Programme disbursements due to data availability.

DISBURSEMENTS TO WOMEN

TIA's proportional disbursements to women is 37.1% (R127.3 million). Based on South Africa's Quarterly Labour Force Survey for the fourth quarter of 2021/22, the proportion of working-age[12] women is 50.4%, with the proportion of employed working-age women being 43.6%. Looking to the latest-available R&D statistics (according to the National R&D Survey for the 2019/20 year), women make up 42.0% of the total researcher headcount. Going forward, TIA needs to strive to be more gender inclusive and bring the gender disbursement ratio closer to parity.

Figure 4: Disbursements by gender

DISBURSEMENTS TO YOUTH

TIA's proportional disbursements to the youth is 37.8% (R133.3 million). South Africa's Quarterly Labour Force Survey for the fourth quarter of 2021/22 reveals that the proportion of working-age youth is 51.6%, with the proportion of employed working-age youth being 34.3%. Given the large proportion of youth in working-age South Africans, TIA can also do more to support the youth going forward.

Figure 5: Disbursements to youth

DISBURSEMENTS TO PEOPLE WITH DISABILITIES

Disbursements made to people with disabilities accounts for 0.8% (R874,508) in 2021/22. According to Statistics South Africa, the national disability prevalence rate is 7.5%.[13] The low level of disbursements directed to people with disabilities by TIA may well be due to underreporting, and data collection practices will be enhanced going forward. Nevertheless, TIA most certainly needs to do more to support people with disabilities as a priority in the future.

[12] Age 15-66 years old.

[13] Profile of persons with disabilities in South Africa report, 2014.

14. DIVISIONAL PERFORMANCE

14.1 COMMERCIALISATION DIVISION

14.1.1 OVERVIEW

The purpose of the Commercialisation Division is to support the process of technological development across key economic sectors by providing funding and other support. This will serve to create commercialisation opportunities for entrepreneurs and will contribute to economic growth in SA. Through this strategic thrust, TIA aims to intensify its efforts to

- increase the rate of translation of locally developed technologies;
- exploit IP from publicly funded institutions;
- ensure that these are commercialised in a manner that promotes economic growth and the competitiveness of industry; and
- respond to the imperatives of transformation and inclusive development.

TIA has focused on leveraging local and global partnerships to support the translation of knowledge from universities, science councils, and the private sector into commercialised innovations that will have a positive impact on the lives of all South Africans. TIA also has sought to take advantage of the so-called "Fourth Industrial Revolution" (4IR) to stimulate the economy and respond to some of the social challenges faced by many South Africans.

The division has leveraged new strategic interventions that combine the strength of TIA's investment support and close collaborations with industry champions and enterprise development initiatives. Its purpose is to deliberately forge real progression with technology innovations in the respective industrial sectors in demonstrating market potential and impact and creation of viable new technology enterprises.

14.1.2 PROGRESS TOWARDS PLANNED STRATEGIC INITIATIVES

In its 2021/22 APP, TIA committed itself to leveraging local and global partnerships so as to support the translation of knowledge from universities, science councils, and the private sector into commercialised innovations that will have a positive impact on the lives of all South Africans. In this regard, TIA planned to work closely with OTTs and with NIPMO to identify disclosed IP for commercialisation and provide the necessary support to de-risk both the technology and commercial aspects of various projects in order to attract other funders or investors for successful commercialisation.

In the year under review, opportunity- (application) building workshops were scheduled and executed with several institutions, which continue to embrace the support provided under this initiative. These efforts created a small but significant number of "pipeline" deals based on the strategic support of key industry players. This is expected to grow in future.

The Agency also planned to engage with individuals who have advanced skills in high-tech areas and who were retrenched due to depressed economic conditions exacerbated by the COVID-19 pandemic. This was done with the intention of leveraging off the collective skills base to help SA to recover economically while compensating for the lost income brought about as a result of retrenchments.

The division started 2021/22 with a smaller than anticipated budget for new projects, with existing sizeable project commitments needing to be serviced. Accordingly, TIA could not implement a systemic intervention to leverage off the skills base to support economic growth and alleviate lost income as planned. Nevertheless, TIA successfully enrolled numerous retrenched, highly skilled technology developers as members of a panel of experts available for a variety of specialist roles for the Agency. While they were underutilised in the year under review, this is expected to rise in the near future.

The Commercialisation Division supports strong early technology and a maturing portfolio of technology innovation investments that possess greater potential for commercial application and industry adoption. These investments require follow-on opportunities for commercial funding investment to be attracted so as to secure adequate support and industry uptake in local and international markets.

The division has commissioned a study that focuses on benchmarking the Agency's fundamental investment practices in accordance with industry standards towards attaining sound investment practices. Such practices should make real progress with IP transactions to make commercially viable investments that are able to attract follow-on investment among the NSI and international investors. This process focused on any inadequacies in investment practices undertaken with the support of external participants (both private and development finance houses). It is currently underway, with the contracted service provider at the Agency tasked with ensuring congruency with follow-on investment instruments frameworks applied in early transactions related to technology venture investments.

Furthermore, the division has undertaken a much-enriched opportunity management practice through expert consultation workshops. These workshops focused on sourcing strategic opportunities that underpin the national socio-economic imperatives (including innovations that stimulate economic transfer in underserved areas and the convergence of traditional industries such as commodities and other industry sectors). The key objective is to source additional expertise and inputs from market leaders to identify opportunities and enable early participation by industry. This serves to safeguard TIA's interest in investing in technology innovations that both have market relevance and demonstrate appeal for industry partnerships with possible or pledged follow-on funding.

In support of TIA's agenda to promote economic transformation through meaningful equitable ownership in emerging technology enterprises across the South African economy, the division has prioritised engagements with the Black Business Council to formulate guidelines for selecting external TIA B-BBEE investment and shareholding partners to commercialise TIA-funded IP outputs. This intervention also ensures that TIA realises an equitable return on investments from successful exit transactions that promote the transformation of key industrial sectors.

One of the key interventions is to support the progression of technology development towards the market through dedicated enterprise development support. The Enterprise Development Framework leverages TIA's position as a thought leader. Furthermore, networking with key industry champions and organs of state, international organisations, and development finance institutions is aimed at providing the investees with three key interventions that are critical growth drivers for the technology innovation portfolio: industry partnerships, access to markets and leveraged funding, and co-innovation investments.

The 2021/22 APP committed the Commercialisation Division to several strategic initiatives for the year. The division's progress towards these strategic initiatives is indicated in Table 6.

Table 6: Progress against strategic initiatives planned by the Commercialisation division for 2021/22.

Planned Strategic Initiatives	Planned Key Actions	Performance for the Year
Artificial Intelligence	• Formulate TIA AI strategy • Liaise with RSA AI Institute	A TIA AI strategy was not formulated in the year under review. However, TIA will be aligning its AI-related efforts with the DSI-funded NextGen Enterprises and Institutions cluster hosted by the Council for Scientific and Industrial Research (CSIR) in support of socially impactful projects. Funding for the NextGen cluster is R100m over three years, and TIA will work with the DSI and the CSIR to leverage this budget through TIA's MTEF allocation to support AI-related initiatives. TIA was officially invited to serve on the sub-committee of the RSA 4IR Institute.
Commercialisation audit	• Scope the intended audit for legacy projects • Determine commercial attractiveness • Establish TIA claim	Legacy projects have been identified and a process undertaken to determine the commercial attractiveness of selected projects. NIPMO has been briefed re proposed scope of the intended audit following an engagement between the two organisations wherein NIPMO confirmed capacity.
Reviewing funding instruments	• Benchmark TIA funding instruments • Moderation of current instruments	Benchmarking study conducted and completed. External service providers have been contracted to implement the same.
Effective DSI funds deployment (Innovation Fund)	• Infusion of best practice in the roll-out • Formulation of founding documents	Successfully implemented with highlights communicated to the shareholder periodically.
Enterprise development	Reconfiguration and consolidation of enterprise development	Presented and approved by the Board. Key focus has been on implementation.
Regime for prevention of IP leakage	• Partner with NIPMO to strengthen disclosure mechanism from OTTs including operationalisation of IP Enforcement Fund • Review and include stricter IP management clauses in existing and future contracts • Deploy Innovation Fund as an instrument to reduce dependence on international venture capital	TIA has determined that the IP Enforcement Fund was placed on hold by NIPMO principals. TIA will actively participate in this initiative as and when it is resuscitated. The division is also taking the lead to identify suitably qualified patent attorneys to undertake a comprehensive study.

14.1.3 BUSINESS UNIT OVERVIEWS

The Commercialisation Division consists of the Advanced Manufacturing, Energy, ICT, and Natural Resources business units.

ADVANCED MANUFACTURING

The DSI Decadal Plan has confirmed that technological innovation is one of the most critical drivers of improving the economic competitiveness of the key sectors of the South African economy, namely: agriculture, manufacturing, and mining. These sectors in particular have been earmarked for modernisation and revitalisation through "Hi-tech" industrialisation.

SA's manufacturing sector has been shrinking for years; its share of GDP has fallen by almost half since 1990, reaching 14% of GDP in 2019. While this is on a par with the contribution of manufacturing in some advanced economies, such as the United States and the United Kingdom (UK), it is far below the average of 20% of GDP in other major developing economies such as Brazil, India, Indonesia, Mexico, Thailand, and Turkey.

The current COVID-19 pandemic, the political and economic climate, ratings downgrades, the slowdown in above-inflation cost increases, increased competition from foreign companies given the volatility of the South African rand, and indications that the emerging market boom is side-stepping SA, does not bode well for the future.

Despite this, manufacturers now appear to be more appreciative than ever of the requirement for technological upgrading now compared to several years ago. Firms operating in distressed sectors may also be more receptive to technological solutions that can enhance productivity and therefore improve competitiveness. This seems well aligned with the Decadal Plan's high-tech industrialisation domain, which identifies three thrusts:

- enabling small business to adopt high-tech
- new thinking for new industries and
- new thinking for old industries.

In support of this, the purpose of Advanced Manufacturing is to support the transformation of SA's manufacturing industry into a competitive, high-tech and high-value-creation industry. The programme focuses on commercialising its invested portfolio in the areas of chemicals, production technologies, lightweight materials, and electronics. It supports innovations that are aligned to the roadmaps in additive manufacturing, automation, advanced electronics, photonics, and aerostructures. These also form the basis of the thematic areas that are part of the 4IR said to transform the manufacturing sector.

The unit supports and prioritises the commercialisation of innovative technologies, especially in the agriculture, forestry, chemicals, health, manufacturing, and energy sectors. Its current portfolio of projects stretches across but is not limited to these sub-sectors.

The NovelQuip project entails the development of a fully automated seedling planter for application in commercial forestry. Existing methods of tree planting are inefficient, requiring a range of expensive capital equipment and exposing workers to harsh, strenuous, and unsafe working conditions. These methods cannot plant trees at the scale required to cater for humankind's growing need for timber and wood by-products, nor to combat deforestation and climate change.

NovelQuip is at present validating a concept machine planter and in April 2022 international project partners, including Ponsse PLC, visited NovelQuip to assess the concept machine's performance. Initial validation has exceeded Ponsse's expectations as the concept machine performed exceptionally well based on the key performance indicators of productivity and repeatability of operations, as well as reliability. Some of the world's largest forestry companies have signed up to test the planter with the intention to place orders. In addition, international trials are expected to start in South America in late 2022. The commercial launch of the planter is planned for 2023.

FibreLux's technology was supported to help local wool farmers to assess wool quality more efficiently and quickly. It is a portable, user-friendly, affordable, and accurate fibre-diameter meter for measuring the fineness of wool, mohair and other animal fibre on farms. TIA successfully diffused the FibreLux technology to small-scale farmers in rural wool grower communities in the Eastern Cape province, for their own social and economic benefit. This was done in collaboration with the Department of Rural Development and Agrarian Reform and with the assistance of the Eastern Cape Communal Wool Growers Association.

Early Detection of Cardiovascular Disease Possible with Cardioflow Device

Figure 6: Cardioflo handheld diagnostic device

TIA funded and supported the full-scale development of the Cardioflow (Cardiflo™) device, a handheld, user-friendly point-of-care screening device for the early detection and prediction of possible cardiovascular disease.

The Cardioflow device is intended for use in the primary healthcare sector where it will improve service delivery to patients who would otherwise not be aware of their risk of contracting cardiovascular disease. The rapid feedback process is an added benefit of the device, enabling nurses and clinicians to diagnose cardiovascular disease almost instantaneously.

Cardioflow detects and predicts possible cardiovascular disease by extracting, normalising, and predicting features of the internal carotid or common carotid artery of the individual using the characteristic features of ultrasound signals. This technology will provide the primary healthcare service with a device that will have a significant impact on the social and economic well-being of the community; it will also contribute significantly to the quality of primary healthcare.

The success of the project can also be seen in the completion of the phase one clinical trial conducted in collaboration with the University of Cape Town (UCT). This trial focused on measuring the activity in the carotid artery for patients. The results of these trials showed the device to be user-friendly and capable of detecting cardiovascular disease. A bonus result from phase one was the clinicians' being able to detect stenosis using the Cardioflow device. This allowed the patients to be referred for further tests by the cardiologist.

On completion of clinical trials the device will be marketed to the approximately 4,200 primary healthcare clinics in SA. The availability of the Cardioflow device will have a positive impact, particularly at clinics located in rural and marginalised areas where access to advanced healthcare facilities is limited.

TIA is proud to see the development and success of this innovation as it will contribute to the improvement of the lives of South Africans by providing technology that will enable efficient healthcare.

ENERGY

The purpose of the Energy business unit is to support the development of innovative energy technologies that contribute to energy security and transition SA to a low-carbon economy. It does this by investing in and commercialising technologies in areas of distributed energy, energy storage, hydrogen and fuel cells, and renewable energy solutions. The unit contributes to achieving the objectives of Hydrogen SA, one of DSI's flagship programmes. In addition, Energy also contributes to the DSI's Renewable Energy Hub and Spoke and the Energy Storage RDI programmes.

Brayfoil Technologies (Pty) Ltd has made significant progress in developing the morphing to be used in wind energy turbines for generating electricity. The construction of the prototype was successfully completed. This was followed by testing the steel structure and load-testing the wings. The test results were positive in that the wing was able to morph well and the shapes created significantly changed lift and drag in a rotating flow – exactly as it was intended. This is a significant achievement because it means the technology is now ready for demonstration. Brayfoil has since concluded an agreement with Stellenbosch University which secures a site where the demonstration will be done and relevant data will be collected which will inform further improvements that may be required.

The company was selected from more than 200 entries to take part in the award-winning Net Zero Technology Centre TechX programme based in the UK with bp Ventures, Equinor Ventures, and Accenture. This came with GBP100,000 (approximately R2 million) in grant funding from the UK government.

Brayfoil Technologies was selected to join the Norway-based Katapult Ocean Fund. It is one of the Top 50 climate investors in the world and evaluates more than 3,000 start-ups a year with a view to bringing them into their portfolio. Brayfoil Technologies received an investment of NOK1.5m (approximately R2.5 million) and a three-month-long acceleration programme.

uYilo eMobility Programme

The uYilo eMobility Programme was established in 2013 to enable, facilitate, and mobilise electric vehicle mobility in SA. It is hosted by Nelson Mandela University in the Eastern Cape province and seeks to prepare SA for the introduction of electric mobility technologies. The programme supports expertise and facilities which extend across national accredited battery testing, material testing, vehicle systems, and a smart grid ecosystem that serves as a live testing environment for the interoperability of the various system components of the smart-grid.

The programme runs the uYilo "Kick Start" fund, which was established to support products or services development related to electric mobility (eMobility) by providing an agile mechanism to fund applied R&D. Four projects were contracted in the year under review for a total funding amount of R2.9 million. These projects related to the themes of energy storage technologies, electric vehicle systems, charging

infrastructure within smart grids, and industry projects that will lead to local manufacturing or support public transportation.

uYilo has partnered with a 30-member consortium led by Local Governments for Sustainability in Germany for the Horizon 2020 Smart Energy Solutions Africa project. This is a four-year project that involves providing innovative energy access technologies and business models that are scalable and can easily be replicated in local communities.

Double-Layer Electrostatic Ultracapacitor

Solzen Energy (Pty) Ltd is developing an ultracapacitor which will be used as an energy storage medium. The company has successfully developed a prototype of the ultracapacitor with an improved energy density. The prototype was developed in collaboration with the CSIR, which assisted with the quality testing of pouch cells. The novelty of the technology – that is, combining graphene (pore size in the range 2 nm–8 nm) with cerium oxide to improve the properties of the storage layer – was confirmed through a novelty search conducted by Adams & Adams.

The system provides large and medium energy users, such as the manufacturing and mining sectors, with the ability to store energy. The energy trajectory shows an increase in the adoption of renewable energy technology – which are intermittent. There are many factors that drive the uptake and adoption of these technologies, the most obvious being the climate change effect on our environment, instability in the grid energy supply, and the current high cost of electric vehicles. This is a major driver of the uptake of storage technology. The ultracapacitor will play a significant role due to its high energy density capability.

Figure 7: Production of The Solzen ultracapacitor, showing the prototype being made (left) and the final prototype produced (right)

Business continuity and electricity sustainability have substantial economic implications on the country's capacity to achieve its industrial goals. As the main economic contributor to the country's GDP, SA's industrial sector requires systems and innovations that would ensure a reliable energy supply.

The innovation and prototype was developed in collaboration with the CSIR and the Austria Institute of Technology. The company will also be working with the University of the Western Cape to achieve the desired results of the technology performance parameters through further developing the double-layer electrostatic capacitor and optimising the technology relating to the coating of the electrode; these will be followed by demonstration and, ultimately, commercialisation. The success of the project will result in an ultra-capacitor with an improved energy density, resulting in better energy storage capacity.

As Solzen Energy, we are eternally grateful for TIA's financial support of our project at the time when we were edging for hope for funding. The funding of our prototype development phase in April 2021 by TIA came at the right time and brought renewed hope and vigour to the project. We are also grateful and impressed with the manner in which requests for quarterly disbursements were considered and paid on time. Resulting from this funding, we are set and ready to embark on our next phase of the project– the pilot phase.

Mr Vusi Ndala,
CEO – Solzen Energy (Pty) Ltd

INFORMATION AND COMMUNICATION TECHNOLOGIES

The ICT business unit aims to increase SA's competitiveness by enabling innovators to participate actively in the development of 4IR technologies and contribute to ensuring that the national goal of universal access to broadband is achieved. In doing so, the unit seeks to achieve the objectives of the ICT RDI Roadmap, with specific emphasis on AI, Big Data, wireless connectivity, and scalable inclusive ICT solutions.

The CSIR's Geo-Location Based Dynamic Spectrum Allocation System project has made significant strides and progress as the project's technology development phase has been concluded. The initial collaboration agreement between the CSIR and the United Nations Development Programme in relation to implementing rural Television White Space technology, and phase one of the Network Operator Support programme in SA was concluded in March 2021. The parties have subsequently entered into another agreement concerning phase two of implementing the rural Television White Space Network Operator Support Programme and supporting SMMEs. This has advanced efforts to bridge the digital divide in SA and support the universal broadband access vision and outcomes. The project has secured further funding to the value of USD1.3 million (approximately R19.4 million) for the period 31 May 2021 to 31 December 2022.

The testbed for the RIOT Network (a last-mile broadband internet connectivity solid for low-income households) in Centurion West, funded to the value of R6 million through the Innovation Fund, was extended into the adjacent township of Olievenhoutbosch. There a portion of the community is receiving temporary free internet access. The partnership between RIOT and Sentech on this project is also starting to bear fruit, and the intention is to extend the project to and share lessons learnt with underserved provinces such as North West in the near future.

TIA Supports a Black Entrepreneur to Launch a Cutting-Edge Innovation to Revolutionise the South African Taxi Industry

The minibus taxi industry is a critical pillar of SA's public transport sector. Not only is it the most available mode of transport, but it is also the most affordable to the public. The innovation, dubbed Commuter Counting Hardware, developed by Quicklo8 (Pty) Ltd, is aimed at advancing the taxi industry by using state-of-the-art technology.

TIA approved funding for Quicklo8, founded and headed by a young black entrepreneur, Mr Mbavhalelo Mabogo. The funding will enable Quickloc8 to run pilot trials in the Gauteng, Eastern and Western Cape provinces. The pilot, which will be run for approximately 12 months, will bring the Commuter Counting Hardware technology closer to being adopted, initially by regional taxi associations and ultimately endorsed by the national government.

Among the functionalities of the innovation is an AI-enabled camera that counts commuters in a vehicle, in real time, at any point in a trip. The success of this innovation would modernise and transform the taxi industry, which is a critical sector of the South African economy.

The Commuter Counting Hardware solution will improve efficiency in the taxi industry, reduce revenue leakage and indirectly make a positive impact to overall safety in the industry. With better revenue management systems, taxi owners will be better able to afford the maintenance of their vehicles, which would in turn translate into improved safety for commuters.

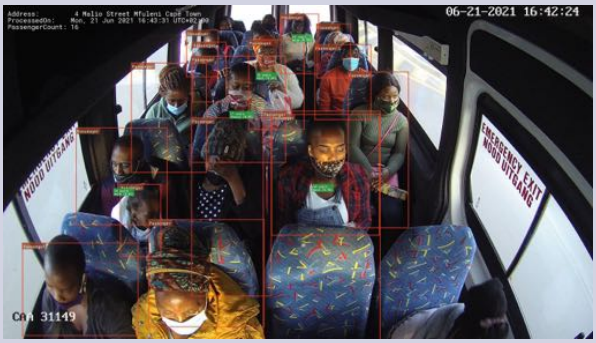


Figure 8: The Quicloc8 system in action

The innovation has been piloted in the Western Cape and has received positive reviews. Quickloc8 works closely with taxi owners, taxi associations, and also taxi drivers in rolling out the new technology for the taxi industry.

Figure 9: The Quicloc8 Team with Minister of Higher Education, Science and Innovation, Dr Bonginkosi Nzimande

Quickloc8 aims to advance the taxi industry using state-of-the-art technology, implementing 4IR technologies as a solution, and supporting taxi entrepreneurs with tools that mitigate animosity in the industry and promotes progress and transparency. Quickloc8 works closely with taxi owners, taxi associations and taxi drivers in rolling out the new technology for the industry. The support from TIA is aimed at developing and commercialising Quickloc8 nationally.

The accolades of Quickloc8 include:

- Winning the 2018 Most Innovative Business in the Western Cape Entrepreneurship awards.
- Winner of the 2020 Media 24 VIA Young Business Owner.
- Successfully rolling out the taxi management app in 2018 for taxi owners in three provinces.
- Acknowledgement by the Minister of Higher Education, Science and Innovation, Dr Blade Nzimande, for the stellar co-operative work conducted with the South African government in improving the taxi and public transport industry.

The success of the Quickloc8 innovation would be another example of a TIA supported innovation making an impact in the lives of ordinary South Africans, by making the taxi industry safer and more efficient.

TIA Supports Local Intelligent Speed Assist Technology to Save Lives on South Africa's Roads

Road carnage in SA represents a significant cost burden on the taxpayer and the economy, costing the fiscus billions of Rand each year. Speed is a major contributor to road accidents and causes a significant percentage of road deaths. TIA is funding the further development and refinement of the SpeedFOX product, an Intelligent Speed Assistance device. SpeedFOX was invented by the Geo Intelligence Corp, a specialist South African geospatial company.

This innovative technology is designed to reduce speeding and speeding-related accidents and mortalities on South African Roads.

The SpeedFOX device is fitted into a vehicle to assist with actively limiting speed, taking into consideration the type and condition of the road. SpeedFOX, with its offline embedded map technology, ensures that a vehicle cannot exceed any of the legally posted speed limits while still ensuring that the driver is always in full control of the vehicle. The initial funding from TIA will be used to refine the development of the device further, to improve accuracy, and to conduct market validation to achieve market fit.

SpeedFOX has been piloted and commercially implemented with several South African companies that own large commercial fleets. In these pilots, SpeedFOX was demonstrated to improve safety through the elimination of speed-limit infringements on the road, which was independently verified through the vehicles' telematics units. Actively managing the speeds at which the pilot vehicles drive demonstrated the potential to save significant costs across these fleets, especially through the reduction of accident damage and downtime, up to a 5% reduction in fuel consumption and the elimination of speeding fines. SpeedFOX has achieved 70,000 independently driven kilometres.

Geo Intelligence Corp is the first company in SA to create a multipoint speed limiter that actively ensures that a vehicle does not exceed any speed limits. SpeedFOX was developed as both a road-safety and cost-saving solution. The funding from TIA will be vital in scaling up and refining the SpeedFOX innovation and tapping into international markets.

The application of Intelligent Speed Assistance technologies has been legislated in most parts of the world. Many African countries are adopting similar frameworks with specific applications in public transportation and logistics. This technology will significantly improve road safety, save lives, increase fuel efficiency, and reduce the costs associated with road accidents. SpeedFOX is designed to work offline and in real time. Apart from being more digitally secure, the solution is more cost-effective and reliable for the local and developing markets than the always-connected options being trialled in Europe.

Fleet operators will be able to set speed limits for specific road types such as gravel roads or steep-gradient roads to ensure that their vehicles are operating within set margins in compliance with traffic regulations.

SpeedFOX will revolutionise the transport industry. Among the strategic goals of TIA is that of industry builder and fixer. Identifying and supporting innovations such as SpeedFOX is one way in which TIA ensures that local innovations have a positive impact on the economy of SA and well-being of South Africans. Transport is one of the critical drivers of economic activity and innovations to modernise this industry through innovative technologies that would create a more efficient and safe transportation system.

NATURAL RESOURCES

The Natural Resources sub-programme supports national efforts in ensuring water security and environmental sustainability. It also plays a role in maintaining a competitive natural resource sector for the country with a specific focus in the mineral resource extraction and exploitation value chain. Strategic focus areas are water resource management, waste management (circular economy, environment), climate change, and mining. It focuses on ensuring water security first by harnessing advanced technologies to improve efficiencies in solving the water crisis sustainably. It also entails supporting the development of technologies that minimise the impact on the environment from waste and supporting technologies to sustainably improve process efficiencies in the extraction and exploitation of natural resources (mining) and reducing worker exposure to hazards in addition to maintaining a competitive natural resources sector.

The aim of the Municipal Operations App for Water Management Solutions project is to demonstrate an expanded, more integrated system across a broader area of the eThekwini Metropolitan Municipality as well as at least three other municipalities (Johannesburg, Zululand and Cape Town).

SA loses R9 billion per annum on water leaks, and this latest technology is making a major impact in reducing the loss of revenue water for municipalities. The demonstration will allow for final testing and validation within a key market segment and also for unlocking key partnerships for the technology uptake by other municipalities in SA and across Africa. The eThekwini municipality approved R40 million (R10 million per year for four years) from internal funding sources to support the municipality's Non-Revenue Water Team with the War on Leaks Programme using the app.

TIA has also been instrumental in growing Blue Cube Systems into an international company with branches in Canada, Australia, and Russia. The Blue Cube MQi technology is based on reflective spectroscopy for slurry and dry applications and absorption spectroscopy for solutions. Calibration is achieved by comparison of the spectral profile of a sample to that of samples with known composition. An in-line sampler is mounted next to the optical scanner to ensure a close link between the optical scanner and the physical calibration sample. Every Blue Cube MQi is linked to the technical centre of Blue Cube Systems by an internet link that enables remote calibration by specialist technicians. Blue Cube systems have been paying royalties to TIA.

Figure 10: The challenge of water leaks can be addressed using an app.

Local Software Engineering Company Makes Strides in Global Mining Operations

The mining industry is the backbone of the South African economy, generating R500 billion per annum and creating 500,000 direct and 2.5 million indirect jobs. TIA has supported the growth of this noteworthy company named Stone Three Digital that is having a significant impact on mining operational efficiencies.

Stone Three Digital, based in Somerset in the Western Cape province, is a pioneering product development company that developed bespoke enterprise software engineering solutions for industry leaders. Their innovation includes the creation of a dashboard to increase the productivity of process plants in crushing, grinding, and flotation by increasing the throughput and stability in crushing circuits, improving the energy efficiency and stability in grinding, and increasing grade, recovery, and stability in flotation.

Stone Three Digital solves real-time measurement problems with industrial AI-augmented machine vision and remote AI-augmented process monitoring and diagnostics. The company also assists its clients to proactively avoid adverse events and to minimise suboptimal performance and associated lower productivity. The innovation has improved the occupational health and safety of the mining environment by extracting advisories from video and other contextualised data. This will contribute to saving jobs and help to prevent mine fatalities.

The Stone Three SmartROC™ (Smart Remote Operations Centre) combines expert services with the power of machine learning to solve problems. The result is an increase in productivity and a safer, happier, and healthier working environment.

The Stone Three SmartROC™ was launched and was able to demonstrate to clients how real-time measurement problems can be solved with industrial AI-augmented machine vision and remote AI-augmented process monitoring and diagnostics. The technology helps clients to avoid the adverse events and suboptimal performance that affect productivity.

Since the launch of the Stone Three SmartROC™, many mining houses locally and internationally have shown an interest in the technology.

The company received additional funding of R5.5 million, which was used to develop the technology further. This assisted Stone Three Digital to conduct trials in different regions and countries, such as North America, Chile and Peru, in varying conditions.

TIA has been instrumental in assisting to grow this South African global player. Royalties from Stone Three Digital to TIA have increased from R100,000 in 2020 to R770,000 in 2021 and are projected to reach R1.5 million in 2022.

The income from royalties is an important income stream from which TIA will be able to support and fund other local innovations and enterprises. The success of the Stone Three Digital investment is evidence of TIA as an industry builder and a market fixer, this in a sector that is a key contributor to the South African economy.

Figure 11: Demonstration of Stone Three's SmartROC™

14.1.4 BUDGET AND EXPENDITURE

A comparison of the budget and actual expenditure of the Commercialisation Division is presented in Table 7.

Table 7: Budget and expenditure of the Commercialisation Division for 2020/21 and 2021/22

	2020/21			2021/22		
Sub-programme	**Budget (R'000)**	**Actual Expenditure (R'000)**	**(Over)/under Expenditure (R'000)**	**Budget (R'000)**	**Actual Expenditure (R'000)**	**(Over)/under Expenditure (R'000)**
Advanced Manufacturing	18,000	19,815	(1,815)	13,400	11,644	1,756
Energy	18,000	8,109	9,891	15,000	20,376	(5,376)
ICT	20,768	31,777	(11,009)	24,873	37,845	(12,972)
Natural Resources	18,000	19,200	(1,200)	19,000	16,140	2,860
Total	**74,768**	**78,901**	**(4,133)**	**72,273**	**86,005**	**(13,732)**

14.2 BIO-ECONOMY DIVISION

14.2.1 OVERVIEW

The purpose of the Bio-economy Division is to support the translation of SA's knowledge resources into sustainable bio-based solutions that respond to societal challenges while contributing to sustainable economic growth. Through this focus area, TIA's efforts are directed towards creating new bio-based products, processes, and services and towards promoting the creation of new enterprises that will ultimately lead to job creation. In doing so, TIA aims to increase its efforts to grow and enhance the role of IKS as an important sector that promises greater potential to promote inclusive development and transformation.

The bio-economy has attracted significant interest to respond to some of the major challenges characterising the 21st century. The cross-cutting nature of the bio-economy offers a unique opportunity to deal comprehensively with interconnected societal challenges – such as healthcare and the burden of disease, food security, the scarcity of natural resources, dependence on fossil fuels, and climate change – while achieving sustainable economic growth.

Advancements in biotechnological research and the resultant uptake of innovation will allow SA to improve the management of its renewable biological resources and open new and diversified markets in food and bio-based products. SA has a significant capacity to generate knowledge in the bio-economy domain. This has the potential to maintain and create economic growth, develop and grow capabilities in human resources, increase the number of jobs and businesses, and improve the economic and environmental sustainability of primary production and processing industries.

TIA has targeted the Health, IKS, Agriculture and Industrial Biotechnology sectors. The capacity to generate knowledge in these sectors and promote collaboration between the public and private sectors is essential to the enhancement of existing value chains and the creation of new ones. The successful implementation of this strategy requires alignment and engagement among multiple stakeholders and role-players across the ecosystem in collaborations facilitated by the optimal functioning of TIA's bio-economy clusters and technology platforms. TIA's bio-economy agenda is aimed at strengthening the Agency's ability to inform research and innovation in the relevant sectors and to facilitate a more coherent policy environment and a more engaged public dialogue. While several opportunities to build industries in biomanufacturing through large investments in innovations at science councils and universities were created, the channelling of funding towards COVID-19 responses meant that the envisaged investment(s) could not be realised.

14.2.2 PROGRESS TOWARDS PLANNED STRATEGIC INITIATIVES

As indicated in its 2021/22 APP, one of the health-related strategic initiatives was to intervene in the area of women's health. Accordingly, TIA issued a call to fund technology development with a focus on women's health issues – in particular, breast and cancer technologies (diagnosis and treatment). While the response to this call was somewhat underwhelming, TIA nevertheless contracted with UCT concerning its Flexigyn project. This project entails the development of a hysteroscopy device. The device aims to provide a solution and improved intervention in women's health, specifically intrauterine conditions, and could assist with the early detection and intervention for multiple conditions in this segment. This could be deployed in both public and private settings, allowing for these procedures to be done outside operating rooms at a lower cost; this would increase the turnaround and number of these procedures and potential interventions.

Other opportunities are at the advanced stages of funding negotiation and include a Genital Inflammation Test for detecting vaginal infection which makes women susceptible to HIV, AIDS and other sexually transmitted diseases, and a cancer treatment intervention.

A further strategic intervention which TIA committed to in its 2021/22 APP centred on analysing IP sources to identify valuable technologies earmarked for abandonment, or technologies which have not been commercialised by universities. The objective is technology-entrepreneur matching, that is, pairing technologies with willing entrepreneurs. In this respect, TIA received a confidential compilation of technologies owned in the main by universities and science councils from NIPMO. The database included all disclosures from TIA's funding instruments. (NIPMO-approved abandoned disclosures were excluded from the database.) Altogether, 166 disclosures were communicated to TIA. A process to engage the database and to identify opportunities for which further funding and commercialisation support can be pursued will continue in 2022/21, with due regard to the strict confidentiality to be observed according to patent law.

The 2021/22 APP committed the Bio-economy Division to several strategic initiatives for the year. The division's progress against these strategic initiatives is provided in Table 8.

Table 8: Progress against strategic initiatives planned by the Bio-economy division for 2021/22.

Planned Strategic Initiatives	Planned Key Actions	Performance for the Year
Clinical Trials Fund	• Establish the Clinical Trials Fund	The co-development of a prioritisation model for the fund was explored with Open Consultants, Germany, based on a concept note developed in consultation with the South African Medical Research Council (SAMRC) and the European and Developing Countries Clinical Trials Partnership. Proposals are pending from the Active Pharmaceutical Ingredient (API) Cluster to pilot the fund on identified chemical entities. Clinical trial applications whilst sought, were not evaluated on time to apply the Clinicals Trial Fund.
IKS Technology Platform	• Establish the IKS Technology Platform	The IKS Technology Platform was established in 2019/20, named the African Traditional Medicines Technology Platform. TIA is exploring making continued funding available for the platform's planned activities in 2022/23 through TIA's MTEF allocation.
Competency-based accreditation and certification system	• Support or facilitate the delivery of a competency-based accreditation and certification system for IKS	It has been determined that this is a function of the DSI's IKS Directorate. No requests for support were received from the DSI.
New bio-based initiatives in industrial biotechnology industry creation	• Hold consultations with stakeholders in biocatalysis, biofuels, bioenergy and algal biorefineries to establish new initiatives starting 2022/2023	Consultation with key stakeholder, the CSIR focussed on developing industry partnerships particularly in the areas of bioprocessing, microbial bioprospecting, biomaterials and biocatalysis with the aim of supporting further technology development to accelerate market uptake of the products developed. Based on industry needs, a call was issued for the development of biobased and biodegradable bioplastics, which also addresses bio-degradability, recycling, production processes and allied. In conjunction with the Department of Trade, Industry and Competition and DSI, TIA participated as Steering committee member in the development of Forest Products Research Strategy. The DSI and TIA concluded a new contract for the second phase of the Strategic Industrial Bio-innovation Programme (SIIP), dubbed SIIP-II to the value of R43.5 million for a period of three years. The first tranche of R14.8 million has been received by TIA to support the initiative.
Aquaculture Bio-innovation Cluster Programme	• Establish a new Aquaculture Bio-innovation Cluster Programme	TIA partnered with the Department of Environment, Forestry and Fisheries and the National Aquaculture Research Forum towards mobilising all stakeholders and establishing the cluster. The ABIPP Steering Committee approved the allocation of R2 million to establish an Aquaculture Cluster, conditional to securing co-funding from industry and other partners towards establishing the cluster. A further R2 million was approved towards a call for proposals. Furthermore, TIA participated as a member in the Aquaculture Working Group on the Oceans Economy Master Plan.
Biomanufacturing Programme	• Implement a Biomanufacturing Programme in support of SMMEs, which will promote the development and commercial application of advanced process and advanced manufacturing technologies	A proposal to establish a Biomanufacturing Industry Development Programme was submitted by the CSIR to make technology and product development capabilities available to the NSI. As of the end of the period under review the proposal was being reviewed by TIA. An additional R19.7 million was received from the DSI to support biomanufacturing initiatives. Furthermore, the CSIR-TIA International Centre for Genetic Engineering and Biotechnology collaboration agreement was nearing near finalisation as of the end of the financial year. The purpose is to explore the in-licensing of recombinant technologies for co-development with the CSIR. A response to an information request to the CSIR is pending to commercialise the Centre's insulin technology together with the CSIR.

14.2.3 BUSINESS UNIT OVERVIEWS

The division consists of the Agriculture, Health, Industrial Biotechnology, IKS, Technology Innovation Cluster Programme (TICP) and Technology Platforms Programme (TPP) business units. The division also hosts several contracted programmes, namely SABDI, ABIPP, and SIIP.

AGRICULTURE

The Agriculture business unit seeks to contribute to the development of a competitive, broad-based, inclusive, and sustainably growing agricultural sector in SA. This will be done through investment in strategic national-sector priorities and value-chain-focused initiatives that will contribute to the development of high-impact technologies, products, and services that would result in growth opportunities to enable new entrants into the sector either for SMEs, smallholder farmers, and rural and township communities.

Agriculture supports technologies with the potential for commercialisation and that contribute towards competitive, sustainable, and inclusive agriculture and agri-business value chains. This includes improving the diffusion of appropriate agricultural technologies to small-scale and emerging farmers. In line with the country's agricultural priorities and disease burdening for the livestock sector, TIA has once again demonstrated its relevance in the fight aimed at combating foot-and-mouth disease outbreaks in SA and neighbouring countries. TIA funded the development of a point-of-care diagnostic test kit and device for early detection of this disease in livestock that can be used in remote and rural areas. The use of this technology enables rapid detection of foot-and-mouth disease and enables farmers to isolate diseased animals to prevent the spread of the disease. The innovation was developed by the CSIR and licensed to a start-up, TokaBio (Pty) Ltd.

The point-of-care device is 4IR-enabled, which facilitates a quick turnaround time for test results. The results are made available in just an hour on a mobile device which enables the farmer to minimise spread of the disease. Currently, it takes a week or two to receive results from laboratories. The device is also connected to the government regulator's database, providing live information about the disease status of livestock. This adds value to the government's livestock disease surveillance programme. Negotiations are at an advanced stage with the Department Agriculture, Land Reform and Rural Development to certify the mobile laboratory and this may see the deployment of the technology becoming a reality, with recently reported foot-and-mouth disease cases in the Gauteng, Limpopo, Free State, and KwaZulu-Natal provinces. Outside SA, the point-of-care technology has been tested in Rwanda, Lesotho, and Zambia.

Figure 12: TokaBio assists Bien Donne with the correct protocols to certify their poultry products (quails) for the export market

TIA continues to make progress with investment towards bio-based products earmarked for crop health and nutrition. Biopher (Pty) Ltd has developed a critical ingredient of the pheroid platform-based (drug delivery system) technique called Prophorm/Anngro to facilitate the movement of bio-pesticide absorption throughout the plant. A critical ingredient for the manufacture of Prophorm/Anngro is Vitamin F Ethyl Ester, which is currently imported at a significant cost.

A batch of approximately 70 kg Vitamin F Ethyl Ester was successfully produced in November 2021 in the newly established small-scale Vitamin F Ethyl Ester production facility funded by TIA. This is a significant breakthrough that will enhance final product development and cost competitiveness, but it will also boost support for SA's production and localisation strategy.

> *Our current joint program with Tokabio technologies will assist us to export our quail products and commodities to clients outside Zambia.*
>
> **Thandi Favard,**
> Bien Donne Farms, Zambia

Figure 13: Ethylated fatty acid production plant

TIA has made progress in ensuring the equitable distribution of investment to extend support to underserved regions such as the Eastern Cape, Mpumalanga and Limpopo provinces. In the period under review, TIA witnessed a successful implementation of the Eastern Cape Agroprocessing-Industry Innovation Programme, with a contract of R6 million over three years entered into between TIA and the East London Industrial Development Zone. A steering committee was formed consisting of representatives from the East London Industrial Development Zone, the Department of Economic Development, Environmental Affairs and Tourism, TIA, the Eastern Cape Development Corporation, the Buffalo City Metropolitan Municipality Fresh Produce Market, and Tiger Brands. The programme intends to increase the provincial agro-processing innovation value chain through structured enterprise development initiatives, technology development support, retail linkages, and the number of TIA funded technologies deployed through the programme.

Agriculture Bio-Economy Innovation Partnership Programme

ABIPP was established an instrument to contribute towards the objectives of the DSI's Bio-economy Strategy, within which the agricultural sector was identified as one of three focus areas. The objective is to strengthen agricultural bioscience innovation to ensure food security, enhance nutrition and improve health, as well as enable job creation through the expansion and intensification of sustainable agricultural production and processing.

The successful implementation and delivery of the first phase of ABIPP led to an extension of the programme until September 2022 and an additional allocation of R22.6 million for programme implementation.

Remarkable progress was made in driving the implementation of the programme while also attracting co-funding opportunities and fostering strong sector wide partnerships. The total amount of co-funding attracted to date amounts to R73.4 million. Six new partnerships were secured during 2021/22.

TIA deployed R995,100 through ABIPP in 2021/22 into a pilot study led by Grain SA towards a possible smart/digital agriculture project. The overall objective of the pilot study is to establish a fully-functional digital agricultural system that supports national biosecurity activities across the value chain, which is a long-term activity. The pilot will focus on the short-term objectives such as to collate, format and store biosecurity data with the objective of ultimately improving small-scale producers' digital competency. In the medium and long term, the focus will be on developing digital tools that will empower producers in their role in biosecurity-related matters as well as developing tools to optimise the use of the Information Hub.

The longstanding partnership which commenced in 2016 between TIA, Grain SA, and DSI is one of strategic importance for the grain and oilseed industry. The partnership intends to optimise innovation efforts in the grain and oilseed research field through harmonisation, synergies, and partnership in areas of strategic focus. Grain SA and TIA have extended the Strategic Innovation Partnership for Grains and Oilseed Programme agreement by a further year, including the allocation of an additional R8 million for programme implementation. This programme has attracted co-funding of R71 million from various industry bodies, namely, the Maize Trust, the Oil and Protein Development Trust, the South African Winter Cereal Industry Trust, and the South African Cultivar and Technology Agency, as well as from Grain SA itself. Grain SA further partnered with Stellenbosch University to host and support a post-doctoral research fellow whose research will feed into the overall strategic programme.

Development of Bio-Based Cosmetics from Cape Aloe

ABIPP is a ring-fenced programme of the DSI implemented by TIA aimed at diffusing technologies to small-scale, emerging, and subsistence farmers. One of the technologies that was successfully transferred is the Cape Aloe agro-processing to develop Aloe ferox-based cosmetics.

The project, based in Seymour in the Eastern Cape province aims to promote the development and commercialisation of new Aloe ferox- (Cape Aloe) based cosmetic products. With the support and training from ABIPP the bio-based technology products are quality tested and meet regulatory and quality requirements, which would ease access to market. In addition to technology transfer, the programme offered enterprise development support to promote commercialisation of Aloe ferox products in that area.

Aloe ferox, called Ikhala in Xhosa, grows wild throughout the Eastern Cape and in parts of the Western Cape provinces. The plant, also referred to as Cape Aloe, has anti-microbial properties and has provided indigenous people with medicinal and cosmetic necessities for hundreds of years. Over the past two decades, this aloe has fuelled an interest in agro-processing and the commercialisation of various derivatives from this plant.

Through ABIPP, the CSIR has since developed a range of six Aloe ferox-based cosmetic prototypes at 200 g lab scale. The face wash, body lotion, hand cream, hand wash, hair food, and hair spray prototypes are currently being modified for consistency, assessed by the selected enterprises from Seymour and being evaluated for their shelf life and skin sensitivity tests.

Key to the success of the project was capacity-building for selected SMMEs and members of the community who had responded to the call for an expression of interest. The training delivered encompassed agro-processing technologies, Aloe ferox processing, and cosmetic formulation development. Trainees received hands-on experience in material receiving, storage, washing, peeling, cutting, processing, and drying into a gel powder. Trainees also had the experience of developing two cosmetic products using the Aloe ferox gel powder they had processed.

A total of 22 black beneficiaries from Seymour were trained on Cape Aloe processing and product formulation. Of these, eight were female and nine of them young people.

ABIPP facilitates, coordinates, and funds multi-institutional, multi-stakeholder Agricultural bio-economy initiatives that are co-funded by industry and TIA. The programme provides support and training on innovative techniques to farmers, assisting SMMEs and farmers in the development and use of bio-based knowledge, products, and agro-processing value-chain processes.

> The TIA Cape Aloe project has been a huge success for the agro-entrepreneurs in the Seymour region of the Eastern Cape. The project had limited funds, however it managed to source the plant material from Seymour, transport it to the CSIR and process it to a stable ingredient for cosmetic formulation development. Six cosmetic product formulations were developed and tested successfully. Twenty-two beneficiaries were trained in Aloe ferox processing at the CSIR. I am proud to have been working on this project, with communities that truly appreciate what has been done for their region.
>
> **Phatheka Ndzotoyi,**
> Senior Researcher: Agroprocessing, CSIR

HEALTH

The Health business unit seeks to support the translation of SA's RDI outputs in the diagnosis, treatment, and management of diseases relevant to SA into products and services that will uplift the quality of life and healthcare for all South Africans. This is underpinned and enabled by collaboration with key stakeholders in targeted initiatives that grow local manufacturing capacity, ensure the security of supply in the health sector, and create jobs to help revive the economy.

The unit aims to enhance SA's global competitiveness in the health arena and to deliver socioeconomic value through technological innovation in healthcare products and services, addressing the diagnosis, prevention, and/or treatment of priority disease areas within SA.

Two key achievements in the financial year were the authorisation by SAHPRA of a local biotechnology company Medical Diagnostech to manufacture rapid COVID-19 antigen test kits, and the authorisation by SAHPRA for a local biotechnology company, CapeBio, to manufacture rapid COVID-19 polymerase chain reaction test kits.

New Animal Vaccines Developed

In the quest to create university-based start-ups and spinouts towards the creation of new industries and fixing market challenges, TIA actively facilitates the development and commercialisation of innovations from universities.

Innovations in animal health and nutrition have been supported and funded by TIA to increase the health of livestock as well as diagnostic technologies to minimise the spread of zoonotic disease. The funding of the UCT-based development and commercialisation of associated recombinant vaccines for the lumpy skin disease virus (LSDV) and bovine ephemeral fever virus (BEFV) is one such example.

Lumpy skin disease is a viral disease of cattle and is typically characterised by nodules or lumps on the skin. The disease occurs throughout Africa and usually occurs during the wet summer and autumn months, when flies are more prevalent. All cattle breeds in SA can be affected by the LSDV. It is a notifiable disease that requires that the state veterinarian be informed as there are specific control schemes for this disease. Up to 45% of the herd can be infected and the mortality rate may reach 10%. The disease causes emaciation, temporary or permanent loss of milk production, lowered or complete loss of fertility in bulls and cows, abortion, and permanent damage to hides.

Figure 14: Lumpy skin disease on a cow

Bovine ephemeral fever – commonly known as three-day stiff-sickness – is an infectious disease caused by an arthropod-borne rhabdovirus affecting cattle and water buffalo. Infection results in fever, stiffness, and a temporary reluctance to move. It is usually followed by complete recovery. In SA, the BEFV occurs throughout the country, from the Limpopo River to the southern Cape coast, with the severity and extent of outbreaks may vary between subsequent years.

Both diseases result in economic losses attributable to the mortality of stock, abortion, decreased milk production, reduced weight, lowered fertility, and the cost of supportive care and treatment.

The project was successful in producing six candidate dual vaccines against both LSDV and BEFV. Among the six candidate vaccines, one (LSDV(SODis)BEFV-Gb-M) showed the best results. It was demonstrated to be safe for cattle, and all vaccinated animals were protected against virulent LSDV and the vaccinated animals produced BEFV neutralising antibodies. A manuscript describing the construction and testing of these vaccines was published in the journal Vaccines in October 2021.

As part of the commercialisation of the successful vaccines, two patents have been lodged and UCT is engaged in pre-commercialisation discussion with a Moroccan biotechnology company. An application for pre-commercialisation funding will be submitted to TIA for support in this phase of development.

Livestock production in SA is a significant contributor to food security and provides many social and economic advantages to various communities in the country. Livestock is also critical for many of the poor in developing countries such as SA and contributes to multiple livelihood objectives. The development and availability of locally produced vaccines is important for keeping this valuable asset healthy and productive. TIA's supporting the development of such vaccines is underpinned by the importance of animal health for the economy, food security, and to curtail the spread of zoonotic diseases.

Regulatory Approval of Locally Developed COVID-19 Antigen Detection Kit

The emergence of global COVID-19 pandemic added to the burden of disease and necessitated that TIA's interventions in health not only align to responding to the pandemic, but also accelerate the response to the nation's long-standing challenge of reducing the dependence on imports in the pharmaceutical and medical devices industry, by stimulating local innovation and manufacturing.

The shutdown of pharmaceutical supply chains and subsequent shortages due to restrictions in traditional source markets such as India and China accentuated the need for SA to prioritise the development of local capacity in the development and manufacture of components for the prevention, detection, treatment, and monitoring of the nation's disease burden.

TIA, in collaboration with the DSI and the SAMRC, awarded a total of R18 million to seven recipients to develop test kits and reagents for use in the diagnosis of COVID-19. Diagnostics was prioritised as a key area for intervention due to the long process for testing for coronavirus infections where test results would be available only after 24 hours. For this intervention, the priority was the development of point-of-care test kits. Such diagnostics are used at the time and place of patient care, which would enable quicker testing and result availability. This aids in providing accurate diagnosis, informing clinical outcomes, isolation where necessary, and contact tracing. These are vital steps in dealing with a highly transmissible pathogen such as the coronavirus.

A key achievement for TIA was the authorisation by the South SAHPRA for two black-led local biotechnology companies Medical Diagnostech and Capebio™. Medical Diagnostech has already commenced industrial-scale manufacturing of the test kits at its Cape Town facilities. This is the first antigen test kit to be made in Africa, and will be made available at an affordable price.

Capebio™was licensed to manufacture rapid COVID-19 polymerase chain reaction test kits. The test kit was co-developed by Capebio™and the CSIR. The work undertaken by the CSIR, involved biomanufacturing and purification of the enzymes used in the kit as well as testing robustness and scalability which were demonstrated internally by the CSIR and validated externally by the NHLS. Capebio™has already commenced industrial-scale manufacturing of the test kits at its Centurion facilities. At full operational capacity, the company will be able to produce up to 5,000 kits a day.

These achievements are a key milestone in demonstrating the ability of the NSI to respond to the pandemic and harness synergies to enable the private sector to partner with state-funded research organisations and use publicly funded IP to provide solutions that reduce imports and ensure the supply of local reagents and diagnostics.

Locally developed and manufactured diagnostic tools or kits will enable import substitution and reduce the financial burden of managing the disease for the country. This intervention served to arrive at both disease management and economic benefits through the commercialisation of the country's R&D outcomes from universities and science councils and support for the localisation of imported products.

The ability to produce test kits locally, is testimony to the level of expertise and excellence in the NSI and an affirmation of the pivotal role of science and innovation in building a capable state.

With the right support and funding the pivotal role of science and innovation to save lives, reduce imports, create jobs, and ultimately improve the quality of life for all South Africans can be a reality.

Figure 15: Locally manufactured COVID-19 polymerase chain reaction test kits developed by Capebio™

INDUSTRIAL BIOTECHNOLOGY

The Industrial Biotechnology business unit contributes to the promotion of the green economy by focusing its efforts on national priorities and gaps in the value chain, thus contributing to the development and commercialisation of environmentally sustainable and cleaner technologies. Bioprocessing technologies are used to convert various types of feedstock or biomass into useful products; these range from bulk products to fine, high-value products.

Notable achievements during the past financial year included the following.

- BioDx, a TIA-funded company, successfully obtained European Union registration to market two of its flagship products to its 27 member countries. This registration is expected to open new global markets for Biodx's products, which include DecontX microbiocide.

- LignOrganic (Pty) Ltd filed for a provisional patent entitled "Recovery of lignin and carboxylic acid from by-products of pulping processes". This process entails the extraction of nano-scale Kraft lignin using organic waste as feedstock. In addition, the enterprise has filed for a trademark in three classes for use of lignin as a natural ultraviolet filter (NatUVcare). The use of lignin as a natural ultraviolet filter has commercial application in the cosmetics industry.

Strategic Industrial Bio-Innovation Programme

SIIP is aligned with TIA's Industrial Biotechnology portfolio. It was established by TIA and the DSI during 2018/19 to support and co-ordinate multidisciplinary programmes; it enables partnerships across institutions to develop innovative technologies, products and processes; support SMMEs; promote green economy, and create sustainable jobs. The first phase of the initiative was extended until December 2022 to allow for delayed activities to be completed. Phase one is expected to run concurrently with phase two, which was initiated in September 2021. To date, the DSI has allocated a total of R87.8 million, including R44.3 million for SIIP phase one and R43.5 million for phase two to support the implementation of the programme.

A total of R54 million has been disbursed to thirty-one projects hosted at 19 implementing institutions, which included 15 initiatives at ten universities, seven initiatives at six SMMEs, seven initiatives implemented at the CSIR, and two initiatives at two non-profit organisations.

During 2021/22, substantial progress was made by implementing institutions in achieving agreed deliverables. Key highlights reported by project teams during this reporting period include the following:

- Nine technology demonstrators were developed by implementing institutions, of which six were developed by the CSIR, two by an SMME (Afrobodies) and one by a non-profit organisation (Durban Green Corridors) based in KwaMashu township in eThekwini municipality in KwaZulu-Natal province.
- One book written by Prof Tonderayi S. Matambo at the University of South Africa entitled *Natural Wetlands: A Holistic Overview towards its Biomimicry for Application in Industrial Effluent Bioremediation* published by Nova Science Publishers Inc, New York.
- Two products were launched by LignOrganic (Pty) Ltd, which included lignin extraction formulations targeted at the cosmetics industry and lignin powder targeted at the paper coating and polyester resins market sectors.
- Sawubona Mycelium (Pty) Ltd, an SMME, entered into a technology transfer and license agreement with the University of Technology in Malaysia to accelerate inbound technology uptake.
- An amount of R20.5 million was recorded as co-funding, demonstrating confidence in the SIIP and enhancing partnerships.
- Nineteen scientific articles were published in refereed journals.
- Nine interns were recruited into the programme, five at the CSIR and four at the TIA Bioprocessing Platform.
- Thirty-seven students and postdocs, including 23 MSc and ten PhD students, and four post-doctoral researchers, were recruited in the programme.

In addition to the above, the Industrial Biocatalysis Hub – a sub-programme of the SIIP initiative – was successfully launched during the Bio Africa Convention in August 2021. The primary focus of the Hub is to provide a platform to support SMMEs in the biomanufacturing sector using biocatalysis technologies to develop and commercialise mature green technologies with the aim of creating sustainable jobs and promoting environmental sustainability. A total of R11.4 million (including R3 million co-funding from TIA) was disbursed to the CSIR to support the implementation of the sub-programme.

TIA continued to support Durban Green Corridor, a not-for-profit organisation based at the KwaMashu Materials Beneficiation Centre in the KwaZulu-Natal province. The focus of this initiative is to promote township economic development through the beneficiation of waste organic biomass derived from alien invasive plants and the development of new value chains to create products with a commercial application.

In addition to the funding received to support the SIIP programme, TIA received baseline funding to the value of R19.7 million from the DSI to support the implementation of the Biomanufacturing Enterprise Development Initiative. This is a sector development and intervention initiative whose objective is to create enabling environments to stimulate and support the development of SMMEs in the Biomanufacturing Industry.

Black-owned SMME LignOrganic at Forefront of Rapid Evolution of Biorefinery Initiative

LignOrganic is a black-owned SMME that is developing bio-based alternatives to chemicals in the hair and skin cosmeceutical industry. With support and funding from TIA through the SIIP, LignOrganic has seen significant growth to be at the forefront of the rapid evolution of biorefinery initiatives to promote and harness bio-innovation for economic growth and social development.

The SIIP was established by the DSI to fund and co-ordinate multidisciplinary programmes. These programmes enable partnerships across institutions to develop new technologies, products, and processes and to support SMMEs, promote the green economy, and create sustainable jobs.

The Gauteng-based enterprise aims to develop a process of nano-scale Kraft lignin extraction through its 'plant waste to Kraft lignin' process using saw dust and macadamia nutshells as raw materials. TIA supported the innovator to develop the extraction process and upscale the production of the Kraft lignin from laboratory-scale to pilot-scale production capacity.

Bio-based products have been formulated and demonstrated in the cosmetic industry. These include a soda lignin powder, a complex organic polymer used as a ultraviolet blocker, antioxidant and antimicrobial agent in cosmeceutical formulations. Some of the products developed with soda lignin powder include hair conditioner and hair butter cream, micellar water, sunscreen and a biosurfactant handwash and make-up brush cleaner. The hair-care formulations have been sold to a hair salon that specialises in child hair care. The attraction to this market is the high protein content of the formulations, making them safer for young hair.

Some of the formulations developed by LignOrganic have been sold in different markets, including the hair straightener market, and to NCS Resins (Pty) Ltd, the largest manufacturer of unsaturated polyester resins in Africa and a leader in the development and supply of innovative test technology.

Having upscaled the lignin extraction process, the company has made further discoveries and is undertaking further R&D.

Green Bioconversion Company Gives Hope to Farming Communities

Khepri Innovations (Pty) Ltd is a 100% black-owned and -empowered organic waste specialist company based in Muldersdrift, Gauteng. Khepri is committed to expanding and uplifting communities in SA by introducing green bioconversion technology. It is an innovative company that specialises in providing holistic professional products and services through sustainable growth in biotechnology, bioconversion, and agro-processing.

Khepri Innovations is funded by TIA for developing a modular technology for insect larvae bioconversion for use in the animal feed market. This innovation responds to the need for a more cost-effective protein-supplement source for livestock feed because the cost of livestock feed has been found to be a major deterrent to livestock farming across all livestock farming segments.

Figure 16: Cage for housing of adult black soldier flies (left) and houses for rearing black soldier fly larvae (right)

Khepri Innovations is an organic waste specialist that converts the problem of food waste into an economic opportunity for communities. They collect waste from clients, sort and process it onsite into animal feeds and organic waste. The use of waste to create new products – waste beneficiation – is a key component of the Khepri innovation.

The company's bioconversion platform uses mass-produced diptera insect species as inputs into livestock feed or components into livestock feed. The company has developed unique technology for the onsite processing of organic waste produced by food manufacturers, abattoirs, and the hospitality sector. The technology allows for waste volumes to be reduced by up to 90% and a decrease in waste management costs for the producer. This waste is used to rear insects, which are then converted into low-cost, high-quality animal feed.

Khepri Innovations is currently using two insect species in their bioconversion process of abattoir and vegetative waste into whole insect meal, fat-free insect meal, feed oils, and high-grade organic compost. This presents a solution to the beneficiation of abattoir and vegetative waste, which are both environmental concerns.

The innovation will benefit animal feed distributors, small-scale and emerging farmers and communities involved in livestock farming.

The initial Khepri Innovations technology at Chamdor Abattoir in Kagiso was conducted in netted and shaded areas, which has enabled Khepri to establish a proof of concept of the use of black soldier fly and common housefly larvae (diptera species) as a source of protein feedstock. TIA funded Khepri Innovations for establishing and demonstrating the modular fly farm technology using containers designed for insect-rearing and propagating the fly species.

Khepri's modular fly farms are designed to be safe and to minimise smells and the exposure of workers to noxious elements of waste management. The innovation offers a simple solution that involves refitting a shipping container into a bioconversion platform using Khepri's patented process. The size of the solution and the number of containers used is determined by the client's bioconversion waste requirements. Khepri Innovations uses entomology and biotechnology to solve a critical problem in the livestock farming sector. The modular format of the technology will allow access to the most marginalised areas and alleviate the production input costs for farmers.

To date, the Khepri innovation has yielded positive results, one of which was the development of a new product called Khepri Fish Bait. It is also notable that the animal feed developed by Khepri is derived from waste as opposed to a food source such as fish meal or soy meal. The feed produced by Khepri has high nutritional content.

SA's Bio economy Strategy seeks to use the country's bio-based resources to create and grow biotechnology-based industries. The application of this biotechnology process yields high-value products that will benefit the agricultural sector and reduce the negative impact of waste on the environment.

INDIGENOUS KNOWLEDGE SYSTEMS

The IKS business unit seeks to harness indigenous ideas by supporting the development of technologies to conduct process development, product formulation, and, where necessary, the clinical validation of indigenous-based natural products. These products have the potential to benefit from increasing consumer demand for naturally produced medicines, foods, beverages, and cosmetics. The IKS sub-programme aims to grow the proportion of funding dedicated to investments in indigenous knowledge-based projects and programmes in its portfolio. The business unit has adopted inclusive innovation approaches that make knowledge holders and communities part of the development and commercialisation value chain and therefore contribute to the creation of community-based enterprises and jobs.

The IKS business unit has supported projects previously funded by the DSI with upscaling and commercialisation efforts; it aims to harness indigenous ideas using the Ubuntu-based Bio-Innovation model. While working towards mainstreaming holistic IK-based R&D, inclusive innovation that supports community-based technology demonstration is the central guiding principle of the unit. The unit's focus on African traditional medicines, IK-based cosmeceuticals, nutraceuticals, and health infusions has served as the basis for technology transfer and the commercialisation of IK-based innovations.

A SA–China Traditional Medicines Flagship Programme has been established at the University of the Free State (UFS). TIA's investment into this programme will enable an indigenous knowledge-based collaborative partnership between SA (through UFS) and the People's Republic of China (through the Beijing University of Chinese Medicine). TIA invested a total amount of R1,500,000 over a period of three years and the Chinese counterpart will co-invest at least R8 million. The programme will focus on the use of traditional medicines for treating various medical conditions that affect the nervous system.

The programme will afford an opportunity for traditional health practitioners who are located in underserved provinces of the Free State, Eastern Cape and Limpopo, among other provinces, during its pilot phase to have the indigenous knowledge used in the development of pharmaceuticals that can be commercialized in the mainstream economy, both locally and off-shore. The funding of the SA–China Traditional Medicines Flagship Programme augurs well with the recent investment by TIA on the African Traditional Medicines Platforms at UFS which seeks to develop research capability in the field of IKS. In November 2021, UFS received authorisation from SAHPRA to use traditional herbal medicine – PHELA 350 mg capsules – as a candidate therapy for mild to moderate COVID-19 in non-hospitalised patients. This was the first time in SA and in the sub-region that SAHPRA authorised traditional medicine-controlled clinical and clinical trials for COVID-19.

Regarding the NIPP Fund, in addition to the total of R21.5 million that TIA and DSI had contributed, the IDC approved co-funding of R16.5 million into the fund. One of the beneficiaries of funding from the NIPP Fund in the year under review was Setsong Tea Crafters, an SMME which produces indigenous knowledge-based teas and health infusions from wild South African indigenous plants.

Setsong Tea Crafters Driving the Legacy of Indigenous Knowledge through Innovation

SA is the third most bio-diverse country in the world, with many of its biological resources existing in the rural landscapes of the country. These biological resources have been used for years in traditional knowledge systems to build and strengthen the body, nourish and rejuvenate the skin, and heal ailments. Most of the knowledge of these indigenous resources lies with elderly members of rural communities.

The Bio-Economy Strategy aims to drive SA's bio-economy through the exploitation of the country's diverse natural resources to improve human health, address food security, and contribute to economic growth. The strategy seeks to use SA's bio-based resources to create and grow biotechnology-based industries. This is crucial for job creation, the building of industries which can be achieved by harnessing human capital and investing in indigenous knowledge-based IP for the economic and developmental benefit of indigenous knowledge holders.

Figure 17: Setsong Tea Crafters empowering women from Sekhukhune community

Figure 18: Setsong's processing of Tepane Black Bush Tea

Setsong Tea Crafters, an SMME funded by TIA and the IDC through the NIPP Fund, produces indigenous knowledge-based teas and health infusions from wild South African indigenous plants. The NIPP Fund was established to fund further development and commercialisation of IK-based innovations. As a NIPP Fund funder TIA also engages external funders to leverage additional funding for these innovations.

The company's product range, which consists of eight types of teas, led to the creation of a platform for job creation in rural Sekhukhune, Limpopo. To date 20 permanent jobs and 15 temporary jobs have been created. Several local co-operatives have partnered with the company to supply processed herbal ingredients to the company.

At the height of the COVID-19 pandemic Setsong extended its product line by including the indigenous artemisia tea to its product range, representing the company's contribution to aiding respiratory health. In 2021 Setsong entered the Food Lovers' Market Group social enterprise competition and emerged as the overall winner. This meant that Setsong is now part of the Food Lovers' Market supplier network through the retailer's Seeds of Change Supplier Development Partnership. The Setsong product range can now be distributed through Food Lovers' Market outlets which presents countless opportunities for the value, growth and reach of the brand.

TECHNOLOGY INNOVATION CLUSTER PROGRAMME

A technology innovation cluster is a collaborative multi-stakeholder vehicle following a broadly inclusive and coherent ecosystem approach geared to identify and achieve common objectives to create a knowledge-based economy in areas of national priority. By adopting a value chain approach and catalysing collaborations among stakeholders, the TICP facilitates an enabling environment for the advancement of technology innovation and commercialisation.

TICPs are collaborative initiatives involving the relevant players' stakeholders along the value chain in an industry such as entrepreneurs, companies, suppliers, associations, manufacturers, and research institutions. Through this programme, TIA catalyses the relationships and streamlines initiatives and related IP developed by these partners to increase the sector's capacity to develop effective technology solutions and contribute to the global competitiveness of the sector.

In the 2021/22 financial year, TIA invested considerable time in the pursuit of a second-phase funding proposal from the Agricultural Research Council for the Beef Genomics Programme, for which industry participation was achieved in the co-development of the proposal. The refinement of the proposal builds on the gains made in the first phase. The programme advocates that the programme to be led by industry, with regard to both funding and the direction of the programme in line with market needs.

A second phase funding proposal from the Dairy Genomics Programme was not received. In the year under review, partnerships with the industry leaders of South Africa's dairy sector will be pursued, to ensure that there is common understanding of the benefits of the transformation of the dairy sector. It is envisaged that TIA will facilitate industry consultations in which solutions to grow the dairy sector through diversified participation and the introduction of competitive technologies will be sought.

TIA will continue to support the large historical investment made into the Animal Health Innovation Cluster. To this end, the development of a new dynamic operational plan has started, and is envisaged to be lead by industry once committed, to ensure that the research and innovation activities of the cluster are driven by market need. This approach will see the early adoption and uptake of developed technologies by the market, such as the much-needed diagnostics and animal vaccines in South Africa and the continent at large.

These interventions by TIA will seek to meet the organisation's goals in ensuring industry competitiveness and growth by existing players and new entrants in the form of SMMEs.

Active Pharmaceutical Ingredients Technology Innovation Cluster

Five projects were funded by TIA in the API Technology Innovation Cluster. These projects have full access to the regulatory compliant API chemical laboratory to support the analytical testing required during the synthetic process of API molecule development and whose equipment is now fully installed and operational.

A key achievement of the cluster this year was to secure funding for the opitimisation of a malaria drug process at Chemical Process Technologies for US$150,000 (R2.2 million) from the Bill and Melinda Gates Foundation through a partnership with Medicines for Malaria Venture. This organisation requested support to ensure that there is a locally available source of a key malaria drug through enabling low-cost manufacturing in Africa, and the API Cluster was able to rise to this challenge and objective to validate a local source of amodiaquine.

The key objectives of this project include localising current manufacturing processes, developing cost models to identify the most cost-competitive process, identifying opportunities to improve technology and/or costs for both, and preparing pilot-scale samples to confirm that technologies are successfully localised.

This project is a demonstration of the API Cluster bringing together international and local expertise to ensure the local manufacture of and reduction in imports of key medicines with the concomitant benefits of technology and skills transfer.

Medical Device and Diagnostics Innovation Cluster

In the year under review, the Medical Device and Diagnostics Innovation Cluster engaged in several activities that were aimed at fully realising the goal of creating a vibrant and sustainable medical device industry in SA. Under the thrust of establishing a cohesive and integrated ecosystem, a landscape analysis of the medical devices innovation sector was published. It is expected that this report will provide a baseline of understanding where the medical device sector in SA stands; and it will be the basis upon which further interventions by the cluster and other stakeholders in the industry are informed.

Regarding localisation and rapid product development, a two-year contract was signed with the CSIR to enable the provision of regulatory and technical support to medical device developers to have quality systems and documentation. As at the end of the financial year, 35 projects had received assistance from the CSIR.

Part of the cluster's goals is to ensure human capital development. In the past year, the cluster has engaged with local universities that offer Biomedical Engineering courses to understand their product offerings as a first step towards creating an educational platform and courses for medical device manufacturers and innovators which should be rolled out in the next financial year.

Forest Bio-economy Innovation Cluster

The FBIC was established through the merging of the Forest Molecular Genomics Programme hosted by the University of Pretoria and the forestry-related initiatives of the CSIR's Biorefinery Industry Development Facility, including bio-SMME support and RDI activities. An amount of R21 million was approved by TIA in the year under review to support the implementation of FBIC over a three-year period. This is in addition to R12 million committed by the DSI to support the initiative. The objectives of the FBIC are as follows:

- To strengthen the South African forestry industry's bio-economy innovation ecosystem.
- To establish strong technology development and innovation programmes which pursue excellence in biotechnology development and innovation in the full value chain of the local forestry and forest products sector.
- To invest in advanced human capital development in biorefinery technologies, plant genomics, precision forestry, and biotechnology.
- To contribute to the Forestry Masterplan's transformation goals of increasing growth and inclusivity through expanding community and black business opportunities in the bio-based segments of the forestry sector.

Significant progress was made during the year under review, including contracting with and disbursement of funds to implementing host institutions.

Notable achievements for the FBIC included the following:

- The University of Pretoria entered into a strategic partnership with the United States Department of Energy-supported Joint Genome Institute Community Science Program based in California (with collaborators from the University of Connecticut and the Australian National University) to undertake the large-scale sequencing of eucalyptus tree genomes. The database of sequenced genomes created will serve as a resource towards the development of fast-growing woody biomass crops for bio-based products and carbon drawdown through restoration and plantation forestry. Through this initiative more than 3,700 eucalyptus genomes will be sequenced, of which 2,200 are currently in South African field trials made possible through strategic partnerships with Sappi and Mondi. The result of this sequencing will place eucalyptus as one of the first plant genera with almost complete genome coverage. Eucalyptus species have the most diverse secondary metabolism of all plant genomes sequenced and this genomic resource will therefore also be a rich source of genes for novel bioproduct development, some with a biomedical application.
- The FBIC received an amount of R11.4 million as leveraged funding from three strategic partners, namely R400,000 from York Timbers (an integrated forestry bioeconomy company and the largest pine grower and processor in the country), R2 million from the University of Pretoria, and R9 million from the CSIR to support the implementation of various initiatives in the cluster.

R15 Million Investment to Boost SA's API Manufacturing Capacity

In March 2022 TIA, in collaboration with the DSI, the North-West University and industry partners, launched the multimillion rand API+ Cluster and laboratory in Pretoria. The API+ Cluster is aimed at driving technology development and the commercialisation of API manufacturing in SA. The API+ Cluster was launched by the Deputy Minister of Higher Education, Science and Innovation, Mr Buti Manamela.

TIA invested R15 million towards the establishment of the API+ Cluster. The initiative will focus on the synthesis of small molecule APIs for human health using modern manufacturing technology.

In ensuring the commercial translation of the API molecules synthesised towards full-scale production, the cluster also established a dedicated pilot-scale regulation-compliant API chemical laboratory. This laboratory will support the analytical testing required during the synthetic process of API molecule development. It will also serve the analytical needs of the API+ Cluster and be accessible to all industry parties. The laboratory is hosted by CPT Pharma and will play a critical role in technology translation from universities and manufacturing scale-up.

Figure 19: Deputy Minister Buti Manamela and DDG Mboneni Muofhe with TIA Board members at the launch of the API Cluster

APIs are the biologically active components in pharmaceutical drugs which are formulated with other ingredients to make finished pharmaceutical products such as tablets and capsules. It costs SA R15 billion a year to import a vast majority of the APIs used to formulate medicines in local plants. This dependence has at times led to import and distribution problems.

The manufacture of APIs has been a priority for the South African government since the large-scale roll-out of antiretroviral drugs for those living with HIV and AIDS, which constitute a significant portion of government's national health expenditure. Reliance on the importation of finished drugs or APIs not only burdens the country with a security of supply risk, but also results in a significant trade deficit for the pharmaceutical sector.

Envisaged benefits of the API+ Cluster for the pharmaceutical industry in SA would include:

- reduction of reliance on imported APIs
- contribution to reducing the national trade deficit in the pharmaceutical sector
- leveraging funding from local and international funding sources
- job creation through the establishment of new manufacturing facilities
- SMME development and supporting in the pharmaceutical manufacturing sector
- improved productivity of the industry
- training and capacity building across the pharmaceutical sector value chain
- development and diversification of the chemicals sector
- export of APIs to the Southern African Development Community region.

The initiative is part of the national Bio-economy Strategy. The strategy seeks to use SA's biobased resources to create and grow biotechnology-based industries; it is critical to job creation, contribution to GDP, exports, the building of industries, and preventing market failures. The TIA Bio-economy pillar plays the role of market fixer and industry builder. As a market fixer, market failures are dealt with – for example, funding for high-risk projects such as API manufacturing. The Bio-economy strategy's initiative for health is to support and strengthen local research, development, and innovation capabilities to manufacture APIs, vaccines, biopharmaceuticals, diagnostics, and medical devices to respond to the country's disease burden, while ensuring the security and a sustainable supply of essential therapeutics and prophylactics.

CPT Pharma was granted a license to manufacture APIs for human health by the South African Health Products Regulatory Authority (SAPHRA) in 2020. This signalled a move forward for the country's pharmaceutical industry.

The API+ Cluster is also set to stimulate industry competitiveness by leveraging the existing skills, technologies, and facilities available in SA. Its foundation will be an aggressive locally developed technology strategy that can be used to leverage collaboration and partnerships in the pharmaceutical sector.

The strategy will realign current capabilities in various sectors, including commercial companies, towards a focused process synthesis and engineering programme. The goal is to develop Drug Master Files for the competitive manufacturing of targeted APIs and to leverage this to set up a commercial pipeline for local API manufacturing.

The API cluster represents TIA's approach to assessing value chains and stimulating the development of activities and interventions to facilitate sector or industry-level engagement through the crosscutting approach adopted in the Technology Innovation Cluster model. This approach is intended to overcome systemic weaknesses that hamper innovation and commercialisation beyond just the provision of funding to individual projects.

With support from stakeholders across the value chain, such as the National Department of Health, the Department of Trade, Industry and Competition, the IDC, and various industry associations, the API+ Cluster aims to establish a cohesive approach to the development of the pharmaceutical sector's value chain by localising the production of this primary input material. The collaborative approach supports joint advocacy and lobbying in unlocking constraints within the policy and regulatory environments, as well as challenges in the local procurement value chain to ensure market uptake of the APIs.

TECHNOLOGY PLATFORMS PROGRAMME

The TPP business unit provides funding to facilitate access to key technical infrastructure and expertise that enables technological innovation in strategic technology areas through eight technology platforms across the country. TIA funding ensures that the technology platforms acquire cutting-edge research equipment, facilities, and associated world-class expertise to lower barriers to public and private users to engage in technology innovation. The value proposition of the TPP is to facilitate access to cutting-edge technological capabilities by investing in and supporting entities to enable them to acquire appropriate technologies and expertise that in turn lower the barriers for others to innovate. The programme is a part of TIA investment toolbox that seeks to enable and stimulate innovation in the NSI. The unit identifies and co-develops opportunities, funds, and supports technology platforms to build the long-term technological capabilities required to build the South African bio-economy.

TIA currently supports a portfolio of eight technology platforms. The capabilities of each platform are provided in Figure 23.

The Drug Discovery and Development Platform is Africa's first and only integrated drug discovery and development centre that aims to translate scientific discoveries into potentially life-saving medicines in areas such as tuberculosis, malaria, and anti-microbial resistance.

The National Metabolomics Platform exploits the application of metabolomics techniques and modelling to alleviate inherited health disorders and disorders due to infectious diseases that plague South African society.

The KwaZulu-Natal Research and Innovation Sequencing Platform has a vision to challenge the status quo and establish one of the world's most advanced and respected genetic sequencing platforms in order to enable and support world-class genomics research and diagnostics services in Africa.

The African Traditional Medicines Technology Platform aims to promote the establishment and long-term growth of the pharmaceutical industry based on SA's indigenous knowledge base and biodiversity, centred on the meaningful participation by knowledge-holders throughout the product development value chain.

The Centre for Proteomic and Genomic Research provides integrated genomic and proteomic technologies with bio-computational pipelines to create fit-for-purpose offerings for users in academia and industry and to assist in the development of unique solutions for biological problems in the human health and the agricultural biotech sectors.

Biosafety South Africa supports the development of successful innovators, effective regulation and confident consumers through supporting and ensuring the sustainability of bio-based products and to increase awareness of and confidence in the national biotechnology innovation system, including the relevant governance systems.

The Cape Universities Body Imaging Centre houses a 3T Siemens Skyra full-body magnetic resonance imaging scanner and a positron emission tomography system together with ancillary systems to support R&D and innovation for improved diagnoses and treatment monitoring across a range of areas such as tuberculosis, oncology, neurology and cardiovascular diseases.

The Bioprocessing Platform offers four dedicated bioprocessing suites designed for fermentation process development and downstream processing. It also houses the Institute for Diagnostic Research with capabilities to support product development in rapid diagnostics such as hybridoma technology, in vitro monoclonal antibody production, immuno-biochemistry, and lateral flow technology.

Figure 20: The eight TIA-supported technology platforms and their capabilities

Investment in technological infrastructure over the next five years is guided by optimising the use of existing capabilities to support biomanufacturing endeavours for small enterprises; strengthening support for IK-based innovators in various value chains in product development, market testing, and validation; enhancing access to large-scale infrastructure requirements to successfully realise integrated biorefineries; developing capabilities for technology and product development in veterinary and human health applications; and developing capabilities to exploit conversion technologies, such as Big Data generation and analysis to exploit local opportunities, among other measures.

Bioprocessing Platform

The Bioprocessing Platform provides infrastructural and technical support to entrepreneurs requiring fermentation-based technologies. During the period under review, the platform entered into a memorandum of understanding and a technology transfer agreement with the Universiti Teknologi of Malaysia. The memorandum of understanding provides opportunities for the exchange of researchers between the two institutions and for capacity-building for students in the field of fermentation biology. The technology transfer agreement has enabled Sawubona Mycelium (Pty) Ltd – a startup that is hosted at the Bioprocessing Platform – to localise the know-how to improve production yields of beta-glucan; it is also able to use competitive techniques to scale up production in a larger facility. Beta-glucan is a high-value product that is in high demand in the pharmaceutical and cosmetics industries.

KwaZulu-Natal Research and Innovation Sequencing Platform

The KwaZulu-Natal Research and Innovation Sequencing Platform continued to lead SARS-CoV-2 genomic surveillance nationally in the year under review as a lead institution in the Network for Genomic Surveillance in Southern Africa. The support to other African countries continued through the provision of next-generation sequencing services and the training of fellows from various institutions. These efforts have led to an understanding of the sources of viral introduction and genetic diversity of SARS-CoV-2 in circulation in the region. This has had a remarkable impact on public health, on policy, and has boosted South Africa's scientific stature internationally.

Furthermore, the platform attained ISO 15189 accreditation from the South African National Accreditation System. This means that the platform is now accredited as a medical facility and will be able to offer HIV drug resistance and SARS-CoV-2 qPCR tests. Importantly, it also means that the platform is able to enter the clinical diagnostic market.

Centre for Proteomic and Genomic Research

As part of the H3Africa, the largest genomics research programme on the African continent, the Centre for Proteomic and Genomic Research processed more than 10,000 African samples. H3Africa focuses on population-based genomic studies of common, non-communicable disorders such as heart and renal disease, in addition to communicable diseases such as tuberculosis.

The centre implements the DIPLOMICS[14] programme on behalf of the DSI. The programme aims to build a network of infrastructure and skills in genomics, proteomics and bio-informatics in the country. A flagship marketplace was created in the year under review to enhance the visibility of the omics infrastructure in SA through promoting access to SA bio-informatics expertise to researchers involved in genomics and proteomics research.

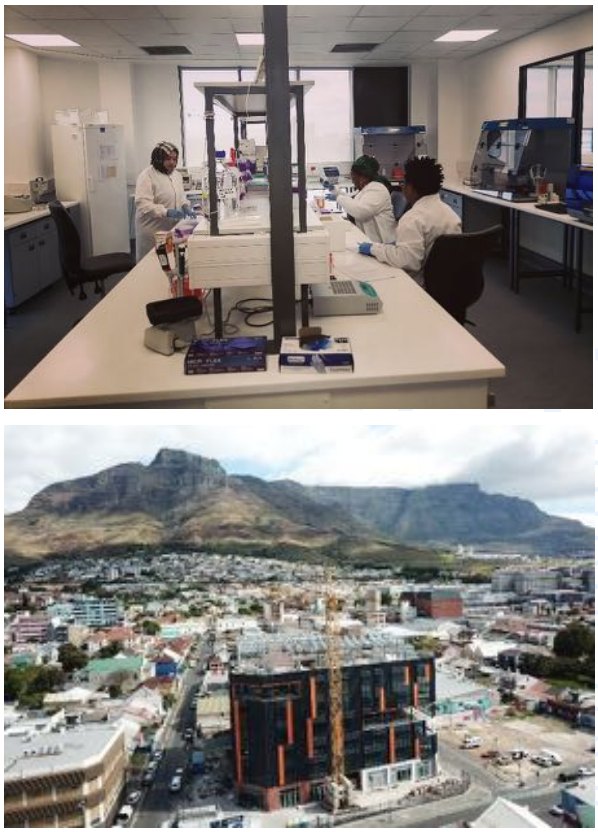


Figure 21: The new Centre for Proteomic and Genomic Research facility in Cape Town

[14] DIPLOMICS stands for Distributed Platform in Omics.

National Metabolomics Platform

The National Metabolomics Platform has concluded a collaboration agreement with a large biotechnology company. The collaboration will see the technology platform characterise the features of an inherited disorder called mucopolysaccharidosis with the aim of establishing a diagnostic screening tool for the disorder. The disorder arises when the human body is unable to properly break down certain sugars whose build-up in the body may result in a range of detrimental health effects such as physical disabilities, organ malfunction, and challenges in cognitive development.

African Medicines Innovations and Technologies Development Platform

The African Medicines Innovations and Technologies Development Platform led the development of the regulatory dossier for the development of PHELA®, an African traditional herbal medicine, as a therapeutic intervention for mild and severe COVID-19. SAPHRA has approved clinical trials in this regard to assess the medicine's efficacy and safety. The application was based on the preliminary evidence produced by the platform's host, the University of the Free State, that the medicine is effective against SARS-COV-2 virus.

SOUTH AFRICAN BIODESIGN INITIATIVE

SABDI is a biotechnology seed fund programme that supports cross-functional innovation in genomics and related biological disciplines (synthetic, structural, and systems biology). The programme places strong emphasis on transformation and skills development for higher-degree postgraduates. SABDI projects attracted more than R4 million in leveraged funding and produced seven technology demonstrators and prototypes, which highlight the maturation of projects with potential commercial outputs.

Three projects are preparing market validation reports to secure follow-on funding. The Open Genome Project, in particular, has grown tremendously into supporting disease management not only in cancer, but also in multiple sclerosis and COVID-19. One of the graduates won funding to commercialise his master's research to produce a point-of-care breast cancer diagnostic. Another SABDI-funded project can now successfully produce good-quality biodiesel using immobilised goat lipases and is in the process of being externally validated.

14.2.4 BUDGET AND EXPENDITURE

A comparison of the budget and actual expenditure for the Bio-economy Division is presented in Table 9.

Table 9: Budget and expenditure for the Bio-economy Division for 2020/21 and 2021/22

	2020/21			2021/22		
Sub-programme	**Budget (R'000)**	**Actual Expenditure (R'000)**	**(Over)/under Expenditure (R'000)**	**Budget (R'000)**	**Actual Expenditure (R'000)**	**(Over)/under Expenditure (R'000)**
Health	13,500	27,681	(14,181)	22,464	14,656	7,808
Agriculture	20,250	26,271	(6,021)	28,327	25,807	2,520
Industrial Biotech	7,200	4,625	2,575	13,404	6,220	7,184
IKS	7,200	4,000	3,200	8,247	3,894	4,353
TPP	36,062	68,557	(32,495)	52,515	69,170	(16,655)
TICP	13,950	21,446	(7,496)	16,337	17,114	(777)
Thought Leadership	4,985	3,664	1,321	12,000	3,634	8,366
Specific contracts (SIIP, ABIPP & SABDI)	25,269	40,802	(15,553)	35,000	81,057	(46,057)
Total	**128,416**	**197,046**	**(68,630)**	**188,294**	**221,552**	**33,258**

14.3 INNOVATION ENABLING DIVISION

14.3.1 OVERVIEW

The Innovation Enabling Division aims to stimulate a culture of innovation and provide enabling support through a range of interventions that make possible the development of innovative solutions that respond to societal challenges. Support is provided through innovation infrastructure and expertise, direct funding and skills development. A key characteristic of the division is the development of innovators alongside technology development. The division targets broader society, from universities and science councils to co-operatives and communities.

14.3.2 PROGRESS TOWARDS PLANNED STRATEGIC INITIATIVES

In its 2021/22 APP TIA committed to increasing the base of technology transfer centres through the introduction of new models of SET support and technology entrepreneurship intermediaries and pursuing the imperatives of transformation. This it aims to achieve through increasing its spatial footprint in underserved and disadvantaged communities. The intention was to offer SMMEs access to skills development and entrepreneurship support in addition to conventional SET support, while at the same time broadening access to the service offerings of the expanded Technology Stations network for SMMEs who may not have had access before.

In the year under review, the following were actioned in support of the commitment stated above:

- Refocused the skills development offerings with an emphasis on innovation, entrepreneurship, and commercialisation skills aimed at increasing the growth rate of tech-entrepreneurs. Tailored-made training was provided in the bio-economy and chemical formulation sectors.

- In diversifying the service offering of selected Technology Stations, the Limpopo Agro-Food Technology Station has assumed management of the Indigenous Knowledge Systems Documentation Centre, previously managed by the Knowledge Management Directorate at DSI. This centre is invaluable in promoting the food innovation agenda and represents tremendous potential for the integration of IKS efforts within the TIA family of interventions. The Technology Station has started IKS evidence validation efforts and re-establishing contact with the Attaqua community in Oudtshoorn. Other communities in the greater Attaqua and Zoar regions have been earmarked for engagement, and in this regard the Technology Station has also developed a protocol for interacting with communities.

- The first phase of upgrading pilot plants and pre-production facilities with 4IR capabilities through retrofitting existing equipment with connected sensors was completed in the year under review. This digitalisation process allows real-time decision-making in a manufacturing

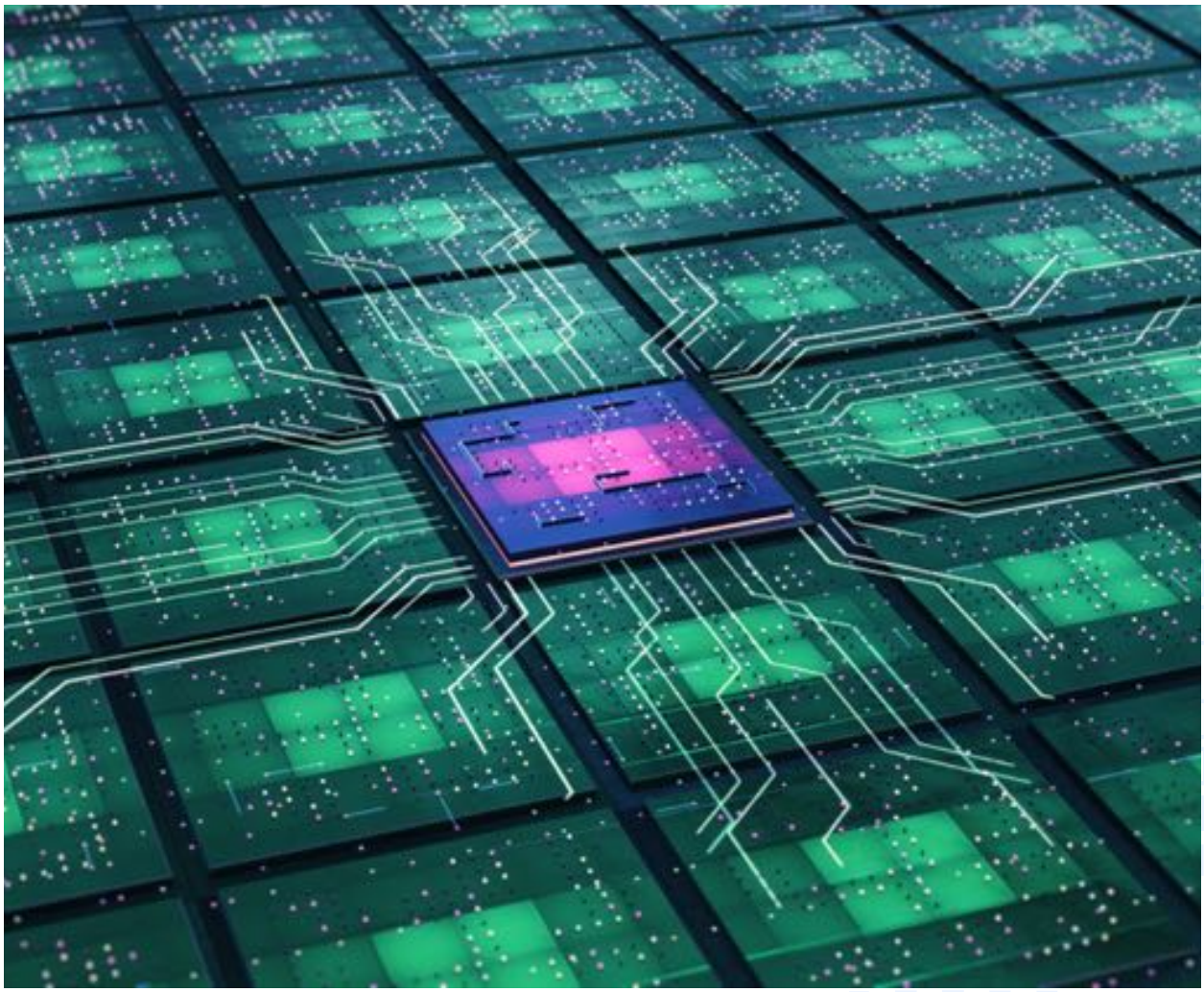
environment, which enhances competitiveness and leads to improvements in manufacturing industries. Subsequent future upgrades will further enhance the smart production capabilities of Technology Stations.

- Technology Stations have focused on providing workshops and training sessions targeting start-ups owned by women and people living with disabilities. The intention was to provide valuable skills to enable entrepreneurship in the 4IR and specifically the Internet of Things through practical user-interface programming and prototyping.

- The Living Labs programme expanded its footprint into four provinces. Three new Living Labs have been established in the year under review, bringing the total number to nine across the country. These Living Labs function as community-based co-creation innovation laboratories that enable the youth to become innovators and local stakeholders to co-create solutions specific to their contexts. In addition, the Idea Generator Centre, also known as i-GYM, was launched in partnership with the Central University of Technology in the Free State province. The i-GYM to offers a developmental hub where students, staff, and the public, with the assistance of experts, can convert their ideas into products.

- The Gauteng Department of Economic Development provided funding to establish a centre in a Technical Vocational Education and Training college to provide SET services to the local textiles industry using a quadrable helix approach. The approach brings together companies, specialised suppliers, service-providers, firms in textile-related industries and associated institutions with the objective of stimulating economic growth in Gauteng.

- TIA has established a new mentorship platform programme through which business mentorship and coaching support is provided to innovators. The TIA mentorship platform seeks to build a pool of both generalist and specialist mentors who will support TIA beneficiaries through formalised and continuous engagement.



The 2021/22 APP committed the Innovation Enabling division to several strategic initiatives for the year. The division's progress against these strategic initiatives is reflected in Table 10.

Table 10: Progress against strategic initiatives planned by the Innovation Enabling division for 2021/22.

Planned Strategic Initiatives	Planned Key Actions	Performance for the Year
Upscaling TIA (Innovation Fund)	• Continue working with DSI to fully establish and implement the next stage of the Innovation Fund • Formalise partnership with the Small Enterprise Finance Agency on DSBD Innovation Fund for early stage investment deployment with TIA • Explore Schedule 3B special purpose vehicle and financial service provider registration	TIA is conducting a due diligence process with three black venture capital firms (Seed South Capital, WZ Capital and IsimoVest), with the intention to work with these companies as co-investors in the Innovation Fund. This is part of TIA's multi-year request for R1bn in funding from the DSI to provide Series A venture capital funding in partnership with venture capital firms, universities and science councils. Exploration of transitioning to a schedule 3B special purpose vehicle for various transacting purposes is still being explored.
Internationalisation	• Develop an export investment support programme for technology-based early stage investments with the Department of Trade, Industry and Competition, SEFA and the SA-European Union Innovation Fund • Conduct feasibility and develop the SA–US University Joint Innovation Venture Fund with the United States through the US Embassy	TIA worked towards establishing a Southern Africa Innovation Collective initiative and non-profit organisation through engagements with stakeholders in Zambia, Tanzania, Namibia, and Botswana as well as SA. The initiative will incorporate a Regional Innovation Fund, a Soft Landing Programme and a Matchmaking Innovation Forum with the purpose of cross-border commercialisation. The approach has been approved by a board of the five member states, including the DSI and is undergoing registration as a not-for-profit organisation, for ease of cross-border transacting and scaling-up. The SA–United States University Joint Innovation Venture Fund is still under construction.
Regionalisation and Living Labs	• Expand national (regionalisation) footprint through deployment of the innovation centres model • Pilot co-location with the Small Enterprise Development Agency and IDC • Deploy Living Labs as nodes and satellites for at district level	Three new Living Labs have been established and funded. These are the Mafikeng Hub (North West), Propella Township Incubator (Eastern Cape) and Northern Cape Development Ecosystem. In addition, the unit is in the final stages of assessment for the establishment of three more Living Labs in the Community Colleges sector at Community Learning Centres in Kokstad in the KwaZulu-Natal province, Rustenburg in the North West province and Kuruman in the Northern Cape province. The Gauteng Department of Economic Development has collaborated with TIA concerning the establishment of a Clothing and Textile Hub. The indicative investment estimate is approximately R20 million over the course of a 3–5 year period. An initial grant amount of R4.6 million has been received for working capital towards testing, piloting and validating the operationalisation of the training and capacity building intervention.
Technology Acquisition and Deployment Fund (TADF)	• Pursue approval for insertion of TADF in the Public Procurement Bill by National Treasury as a national innovation procurement framework and instrument • Conceptualise TIA Academy	Four projects have been approved for funding through the TADF. A targeted call was issued to grassroots innovators in the portfolio that had government-facing solutions that were near deployment ready. Nine projects have been recommended for approval. There are continued ongoing discussion with the Chief Procurement Officer at National Treasury and the State Owned Procurement Forum.
ISED	• Develop a micro-enterprise development model directed at promoting the establishment of small companies from low-risk technologies. Typically, this model should be geared towards grassroots innovators, innovators from Living Labs and the SFP • Conceptualise TIA Academy	The TIA Academy's four phased programme model was in the process of implementation in the year under review. It is being implemented in partnership with the Camblish Training Institute to offer training and support to 60 new grassroots innovators in the portfolio. TIA's Mentorship Platform was established which aims to match mentors to mentees from across the division's various programmes and initiatives through providing expertise, knowledge and support for successful entrepreneurship. A total of 38 mentors and 20 TIA-supported mentees were registered on the platform. The pilot phase will entail assigning mentors to each mentee through the programme. The micro-enterprise development model was in the process of being finalised as of the end of the year in partnership with Innovate UK's Knowledge Transfer Network, industry and local sector education and training authorities.

14.3.3 BUSINESS UNIT OVERVIEWS

The division consists of the following sub-programmes and business units.

ENABLING, FACILITATION AND DE-RISKING FUNDING AND FUND MANAGEMENT

Seed Fund Programme

The SFP assists researchers based at universities, science councils, and SMMEs by providing funding to translate their research outputs into fundable ideas for further development. The programme provides conditional grant funding for technologies between technology readiness levels 3–8. The SFP supports innovators in achieving the following goals:

- Advance or mature research outputs and ideas to develop prototypes, proof of concept, and business cases that could be used to attract follow-on funding opportunities and for further technology development.
- De-risk research outputs for follow-on funding to attract other funders.
- Assist innovators with small-scale trials and market testing.
- Demonstrate innovation value propositions to attract commercial partners.

The SFP is positioned as a project preparation instrument that aims to de-risk early-stage technologies from public-funded research institutions and SMMEs to create a pipeline of technologically feasible and commercially viable projects for the NSI. It is implemented in partnership with Offices of Technology Transfer at universities and science councils, and together with regional development agencies and incubators.

The programme provides funding for a set of fundable activities:

- prototype development and IP
- detailed primary market research
- refining and implementing designs
- conducting field studies, piloting, and technology scale-up
- techno-economic evaluation studies
- production of market samples and/or associated testing
- support of certification activities and specification sheet development
- business plan development.

In the year under review, the DSI confirmed the allocation of R33 million over three years towards implementing the SFP, with the first tranche of R11 million received in the year under review. This development is positive as it provides stability and predictability to TIA and its implementing partners with this highly relevant programme.

The SFP has played an immense role in supporting and enabling innovation from publicly funded research outputs from public research organisations and SMMEs to ensure translation off ideas to technological products and services that solve national challenges and has potential to increase the competitiveness of South African industries. In the period under review, the SFP provided funding to 82 projects, of which 67% originate from universities and science councils, while 32.9% came from SMMEs. It is important to note that 28% of the funded projects came from women and 23% are youth-based projects. Approximately R7 million in co-funding was leveraged from implementing partners. Figure 25 and 26 depicts the sectors of focus and regional split of funded applications.

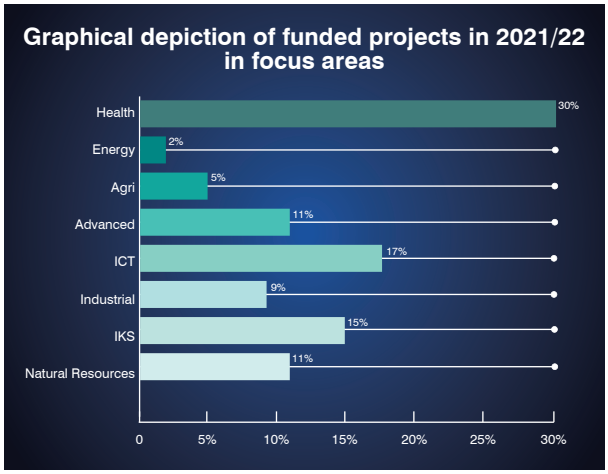


Figure 22: Focus areas of funded projects in 2021/22

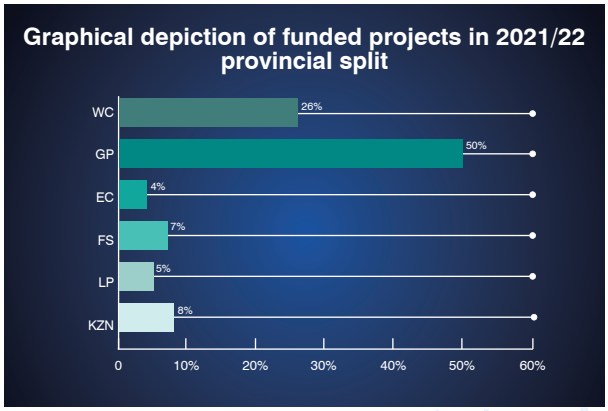


Figure 23: Graphical depiction of funded projects in 2021/22 showing (a) focus areas and (b) provincial split

TIA and the SAMRC entered into a co-investment agreement concerning a Seed Fund for medical devices and diagnostics. Both parties have contributed R2.5 million, which will be disbursed through the SAMRC.

In the period under review, projects in the SFP portfolio have progressed towards commercialisation, where 64 knowledge innovation products have been successfully developed, including prototypes and IP-registered technology demonstrations. Three projects have reached the market.

The Awêh Panic Button by Aizatron (Pty) Ltd is a low-cost panic button that uses Bluetooth technology to provide safety and security to individuals who may find themselves in unsafe situations. When activated, the button notifies people nearby via their cell phones that a potential victim near them is in need of help or assistance, providing them with the potential victim's location and details. This makes possible an immediate response where the community as a whole can respond and assist the person in need.

The project received R699,750 from TIA SFP through the Cape Design Institute in 2020 with the purpose of implementing further software development, testing, and deployment. Following successful countrywide pilot trials in 2021, the Awêh Panic Button and the Awêh Guardian app are now completely developed and can be purchased via the Google Play Store, iOS AppStore and the company's website (www.aweh-app.com).

Aviro Health involves the development of Ithaka, a digital health platform that automates patient interaction to improve the efficiency of healthcare workers by enabling patients with various chronic diseases to be managed remotely. It can be accessed by patients via either app, data-free mobisite or WhatsApp chatbot. The project received R333,333 in funding from TIA through TuksNovation for software development and testing.

In 2021, Aviro Health raised R16 million in a pre-series A funding round from ASISA ESD Fund (managed by Edge Growth). The funding will be used to improve and expand Aviro Pocket Clinic, a digital counselling service made available through health providers in the public and private sectors that empowers patients with accessible and engaging counselling and linkage to services via mobile phones or devices in facilities.

Karoo Bioscience is a South African company aiming to produce compliant (European Union Good Manufacturing Practice) medicinal cannabis through the establishment of a tissue culture laboratory. Such a laboratory is used for cloning plants, facilitating rapid production in an energy-, cost-, and time-efficient manner which also minimises genetic drift. The project received R699,697 in 2020 and is managed through the Cape Design Institute. The project forms part of a greater medicinal cannabis propagation project for the export market. In this year, Karoo Bioscience secured R9,812,960 in follow-on funding from various funders.

Innovation for Inclusive Development Programme

The IID programme is a ring-fenced implementation unit that supports the DSI's portfolio of projects and programmes in the area of inclusive development. IID incorporates the Grassroots Innovation Programme, the Innovation for Local Economic Development Programme and the TADF.

Key to the functioning of this unit is its responsiveness to national and local government technology innovation needs and challenges through an inclusive, empowering deployment model that involves previously disadvantaged individuals and institutions, SMMEs, co-operatives, not-for-profit organisations and not-for-profit companies.

The underserved provinces are priority areas for the unit's programmes and initiatives. Within the District Development Model, the unit works closely with the Zululand District that is championed by the Minister of Higher Education, Science and Innovation and the Ugu District that is championed by the Deputy Minister of Higher Education, Science and Innovation. The unit is responsive to the realities facing the country. For example, specific initiatives are being proposed to be rolled out in the new financial year on disaster management and early notification technologies, and also on green and sustainable settlement technologies in response to the recent floods in KwaZulu-Natal.

TIA recorded leveraged funding of R49 million for the Viability and Validations of Innovations for Service Delivery Programme in the period under review. The programme is implemented by the DSI in partnership with the South African Local Government Association and the Department of Cooperative Governance and Traditional Affairs, with funding from the European Union Sector Budget Support Programme and National Treasury to help municipalities pilot technology and innovations that could help to improve basic service delivery.

Grassroots Innovation Programme

This programme supports indigent and marginalised innovators outside formal business and innovation systems and networks through a multi-tiered support package. Through this programme, TIA has enrolled 110 innovators in the programme across all nine provinces and leveraged additional funding of R19.8 million with two funding partners: the Insurance Sector Education and Training Authority and the Department of Tourism. Twenty-six innovation products were produced in the year under review in the form of patents, prototypes, and others. Fifteen new enterprises were created which introduced new products to the market.

Two strategic platforms were created to launch the products produced. In June, five youth innovators launched their products in the market and in August 5 women innovators launched their products to potential consumers, follow on funders from government departments and the venture capital community and other government support agencies. Six innovators from the portfolio with technologies ready for piloting received follow on funding of R1.8 million from TIA for piloting activities. In addition, R1 million was raised by innovators who were winners of the SAB Foundation Awards. Selected highlights are as follows.

- The KA–DAH device, developed by Tieho Tsiane, is a technology that assists visually impaired individuals to navigate and access the functions, controls and apps of smartphones without the need to use the touch screen of the smartphones. A functional prototype was tested on ten visually impaired individuals from a local non-governmental organisation in the Free State province. Additional funding of R300,000 was secured from the SAB Foundation.

- Rhoda Storm, who entered the Grassroots Innovation Programme when he was in Grade 11 in 2021, has made significant improvements to his pneumonia diagnostic machine learning model. These have resulted in a 68% increase in the model's diagnostic speed. A new model is currently under development that will incorporate the pneumonia diagnostic model to identify and categorise 13 other lung infections. The project attracted R500,000 from the SAB Foundation.

- Prev Leak, by Thulani Khumalo, developed three polymer manhole covers made from recycled plastic through the Biocomposite Cluster. Following their manufacture, electronic units were attached which use an ultrasonic sensor to detect sewage spillage. The prototypes are currently being tested in a real environment at the City of Johannesburg.

Living Labs Programme

The Living Labs Programme is designed to increase the spatial footprint of innovation in SA through the establishment of community-based co-creation innovation labs and support programmes that enable youths to become innovators and local stakeholders by co-creating solutions specific to their contexts. The programme has affected a total of 193 beneficiaries across the five Labs in four provinces. The beneficiaries have received various forms of innovation support, ranging from capacity-building training, prototyping, and IP registrations through to the establishment and registration of businesses, etc. through participating in an extended innovation support programme.

The existing Living Labs portfolio is as follows:

- Bofolo Living Lab in Raymond Mhlaba Municipality, Eastern Cape (rural area)
- Macro Informative Youth Agency in Maluti-A-Phofung Municipality, Free State (rural area)
- Innovate Durban Co-Lab in eThekwini Metropolitan Municipality, KwaZulu-Natal (township)
- Smart Xchange Living Lab in eThekwini Metropolitan Municipality, KwaZulu-Natal (township)
- Rlabs in Cape Town (Athlone), Western Cape (township)
- Propella Township Incubator in Nelson Mandela Bay Municipality, Eastern Cape (township)
- MafiHub Living Lab in Mahikeng Municipality, North West (rural area)
- Northern Cape Developer Ecosystem in Francis Baard Municipality, Northern Cape (rural area)

Three new Living Labs were established in the year under review, and will receive a total of R4.5 million in grant funding. These Living Labs are as follows:

- MafiHub Living Lab, located in the North West province, is a 4IR-enabled open innovation platform which aims to empower and develop individuals and communities through creating new business opportunities, solving day-to-day community problems, and creating innovative sustainable jobs, while contributing to the local innovation ecosystem.

- The Propella Township Virtual and Mobile Pop-Up Techno Garage Makerspace Lab in the Eastern Cape province is a technology platform extended from the Propella Business Incubator into surrounding communities. In this way it increases the outreach and impact of the incubator.

- The Northern Cape Development Ecosystem in the Northern Cape province is a hybrid platform which aims to support beneficiaries through a structured digital innovation support programme.

Selected Living Lab project highlights are as follows:

- ShazaCin is an audio-descriptive app, NOBA, supported through the SmartXchange Living Lab. The invention is owned by a female entrepreneur, Ms Shakila Maharaj, from the KwaZulu-Natal province. The project aims to develop a mobile application, ShazaCin, and to develop content that enables ShazaCin to function. The vision of the project is to create access to visual media (such as movies) for persons with visual disabilities through audio description via a smartphone app. The project attracted R300,000 from the SAB Foundation.

- Hydra Power is supported through Innovate Durban's Co-Lab; it produces residential, commercial, and industrial wastewater for energy system products.

- SpazaUp developed by MIYA is a digital ecosystem platform that enables South African spaza-shop owners, wholesalers and producers (or farmers) to collaborate to create value for the end-user or customer and enable bulk buying, which increases the profits to spaza-shop owners. This project is being implemented in Maluti-a-Phofung Municipality in QwaQwa, with 72 spazas participating in this co-creation experiment. The app, named SpazaUp, allows users to place orders, to leverage on bulk buying, and to negotiate discounts with suppliers and wholesalers on behalf of users. The app has been tested with users and final technical aspects are being finalised; they are expected to be ready for users early in 2022/23.

Zlto Platform Developed at Living Labs to Provide Opportunities for Unemployed Youths

The Zlto platform, supported through RLabs in Athlone in the Western Cape province under the Living Labs Programme, provides youth with access to work opportunities that enables them to develop work experience. Zlto is a blockchain technology enabled platform aimed at increasing engagement amongst young people, tracking positive behaviour via live dashboards and encouraging positive behaviour through innovative rewards systems including retail vouchers.

Zlto runs a digital rewards platform where members are incentivised for validated work and self-directed learning or training programmes. Zlto works with more than 3,000 stores, including major retail stores and local vendors. Members earn points that can be converted into vouchers to enable purchases from the stores. These incentives are targeted at community members and mainly at youths.

Zlto allows young people to initiate education-related voluntary work in their communities. The community work includes activities such as tutoring children, cleaning schools, community gardens, or voluntary work with non-governmental organisations and partner organisations. For example, if a community member volunteers at a local school or clinic, the facility manager will provide a report and approval of the work performed is verified through the blockchain smart contract. The work is verified by peer-reviewers using blockchain smart contracts before the young people earn Zlto rewards in their mobile wallets.

While accessing these training and development opportunities, youths are rewarded in Zlto digital currency. This allow them to access a higher level of opportunities such as formal jobs, education, and small business finance or financial services. To date, the platform has reached more than 200,000 youths. Users have completed more than 1 million micro tasks and more than 1.5 million nano course completions on the platform.

The Zlto backend infrastructure draws from several leading blockchain technologies. The primary aim is to create a reliable and scalable system for evaluating work and storing verified work assets. The system's essential principles are immutability, low latency, and a high rate of secure transactions. All entries are verified by the Zlto network and verifications are securely stored. Security of information is also enabled by blockchain technology.

One of the positive attributes of the system is that users do not need mobile data or airtime to access their accounts on the platform. The system has been well received in other African countries such as Tanzania and Nigeria.

Figure 24: The Zlto Platform incentivises the youth for social good

Technology Acquisition and Deployment Fund

The TADF is an instrument advocated by the DSI. It aims to promote the procurement of locally developed technologies by the state at all levels, including state-owned entities. Four projects are currently being implemented with the objective of taking locally developed technologies to clients in the public sector and provide market-entry support to innovators. This is done through the provision of first-purchaser funds to enable market-entry samples to be produced and trialled by public-sector clients. Successful trials may benefit the SMME through securing offtake agreements. The four projects are as follows:

- Memeza Community Safety is a black female-owned social enterprise that has reportedly developed SA's first public alarm system endorsed by the national government and the South African Police Service. The alarm system was designed and built for low-income communities to improve the safety of the most vulnerable people in society (women, children, elderly, disabled, public schools and SMMEs) who do not have access to the private security industry. The project will manufacture and install 349 community alarm units in Gauteng through its existing endorsement with the Civilian Secretariat for Police. Six youth ambassadors will receive technical product training and product sales training. The project has received R950,000 in finding from TIA.

- The Digital Schools Communication Platform is a mobile communication platform for teachers and parents in township and/or previously disadvantaged schools who are not able to afford access to existing similar educational technology platforms. The company will deploy its technology to 15 schools in the eThekwini district in the KwaZulu-Natal province in partnership with the Department of Basic Education in this province, with two employed youths being trained on the system. The project has received R950,000 in finding from TIA.

- Fun-doola is a portable and compact school, work and home-study desk and chair. This device is used by students and adults who are disadvantaged by a lack of space in the home and the work environment. By being foldable, it allows the user to deploy his or her desk and chair when needed and store it in a space-efficient manner when not in use. Some 500 units will be provided to the Klein Eden Primary School in Vryheid, KwaZulu-Natal province, with the possibility of further distribution to neighbouring schools in the area. The project will create employment for ten individuals and has received R883,000 in finding from TIA.

- Sisanda App Universe is a bundle of science apps that aims to make science fun and enjoyable. It helps learners to conduct science experiments anywhere and anytime. The apps use the power of augmented and virtual reality to project 3D digital science apparatus in front of the learner. The content ranges from life sciences, physics, and chemistry to out-of-the-class content. The company will deploy its technology to 500 users in five schools in the Gauteng and Free State provinces, having received R999,133 in finding from TIA.

SMME SUPPORT PROGRAMME: SCIENCE, ENGINEERING AND TECHNOLOGY SUPPORT INFRASTRUCTURE

Performance of the Technology Stations Network

The programme provides technology innovators in targeted industries and communities with access to state-of-the-art equipment, infrastructure, and expertise in specialised fields that would not otherwise be available or where it would not be affordable for them to commercialise their innovations.

Support services provided by Technology Stations ranges from prototyping to pre-commercialisation. It includes testing and analytical services, rapid prototyping and manufacturing, consultation, technology audit and feasibility study, process or product improvements, applied development, engineering and design, R&D, and technology demonstration and training. The initiative supports mainly SMMEs, individual innovators and researchers.

The TSP enables academia and industry to take part in technology transfer and development by facilitating their interaction and reducing barriers to market access through subsidised services offered by a network of 18 Technology Stations located across the country.

For the year under review, TIA achieved an annual performance of 3,167 SMMEs supported through Technology Stations, representing 90% of the target of 3,500. Of 3,167 SMMEs supported 2,628 (83.0%) are HDIs, 1,435 (45.3%) are women, 1,857 (58.6%) are youths and 27 (0.85%) are people with a disability. A total of 33 co-operatives and nine non-governmental organisations were also supported to improve their competitiveness and productivity.

For 2021/22, the Technology Stations supported 96 high-level research graduates (i.e. honours, master's and doctoral students) that are either fully funded or co-funded in designated niche areas through the Technology Stations network in SET activities. Particulars of this support are provided in Figure 28.

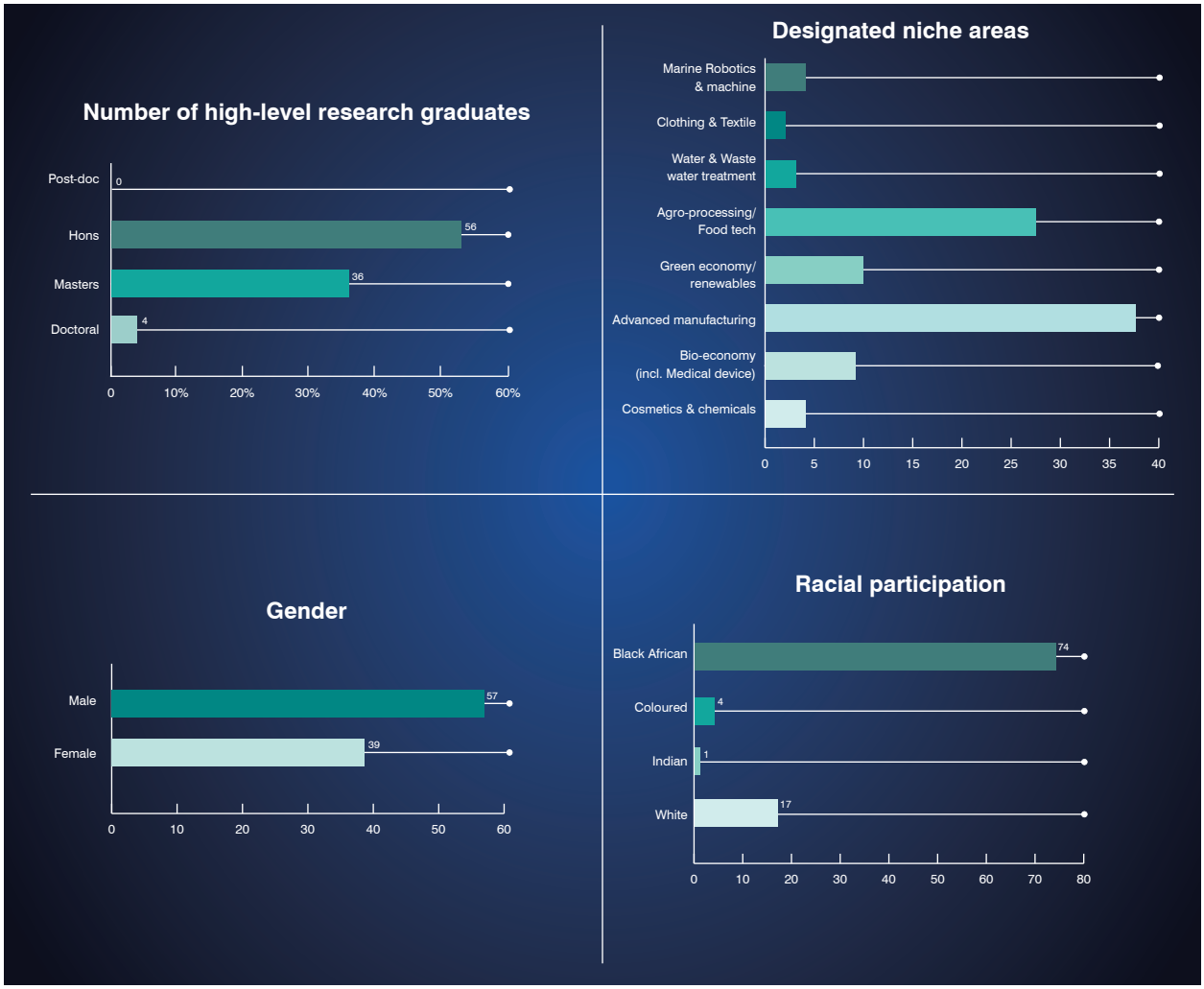


Figure 25: Particulars of the 96 high-level research graduates supported through the Technology Stations network in 2021/22

158 knowledge and innovation products were produced in 2021/22. All the reported disclosures were made through OTTs as governed by the IPR Act. These include 70 innovation products, i.e. 32 prototypes, 18 technology transfer packages and 20 technology demonstrators. There were also 88 publication outputs and eight registrable IP disclosures.

Expanding the Technology Stations Network

In its pursuit of attracting alternative funding and diversifying sources of income to undertake initiatives to expand its geographic footprint, TIA has partnered with the Gauteng Department of Economic Development to establish a Textile Hub as an infrastructure expansion for Technology Stations, which will also link to Eskom's filter bag programme for decarbonisation. The partnership is valued at approximately R30 million over the next five years, with the first tranche of R4.6 million received by TIA in the year under review for phase one implementation.

A facility for SET support infrastructure called the i-GYM was launched at the Central University of Technology in the Free State province. The i-GYM was located at the university because of TIA's initial grant funding and the close links it has to the OTT, the Technology Station and the Department of Entrepreneurship at the university. The i-GYM is seen as a significant boost to the efforts to strengthen the university's innovation and entrepreneurship ecosystem in support of socio-economic development in the province. This facility is accessible to employees, students, high school learners, SMEs, and the broader community to enable them to ideate and prototype their ideas. In addition, it will serve the broader higher education sector, including TVET colleges and Community Education and Training Colleges in the area.

Modernising the Technology Station in Clothing and Textiles

A medical textile-testing laboratory was in the process of being established in the year under review to assist with COVID-19 relief at the Technology Station in clothing and textiles at the Cape Peninsula University of Technology in the Western Cape province. This will involve modernising the Technology Station's facilities and ensuring it is accredited and adequately geared to respond to the challenges and opportunities arising from the 4IR and sectoral master plans.

Leveraging the Technology Stations Network in Support of College

The network of Technology Stations continues to position TIA as an ideal platform on which to enable transformative change in society through expanding and modernising SET infrastructure at Technical and Vocational Education and Training (TVET) and Community Education and Training colleges. Technology Stations' support to TVET colleges is aimed at upscaling grassroots innovation to benefit communities via technological infrastructure, scientific capacity, and expertise at universities in partnerships with civil society while creating a better enabling environment for exploiting the R&D outputs of universities in partnership with other government agencies and entities.

For example, the eNtsa Technology Station has delivered technical training to TVET college staff members in the Gqeberha area, specifically 3D printing technology and metallurgy in collaboration with the 'High Gear' initiative. This initiative aims to create a skills development ecosystem that is co-ordinated, dynamic and responsive to the needs of young people and employers in the automotive manufacturing industry.

Medical Device Development at the Product Development Technology Station

During the past decade, the Central University of Technology in Free State province, through the Centre for Rapid Prototyping and Manufacturing, has established itself as a global player in medical device additive manufacturing and development. Located in the centre, the Product Development Technology Station (PDTS) focuses on localising medical devices and components through a range of manufacturing technologies to reduce reliance on imported medical devices.

Description automatically generatedThe PDTS has identified a lack of understanding of the requirements for and the ability to obtain relevant certification for market entry to bridge the gap between product development and mass manufacturing. Certification has been and will continue to be a focus of the PDTS. The PDTS aims to provide a holistic ISO13485-certified medical device development solution in the future, facilitating products from development and manufacturing through to certification and market uptake. PDTS has already implemented an ISO9001 system, built on an ISO13485 base.

PDTS is a collaborator in the established DSI-funded Medical Device Additive Manufacturing Technology Demonstrator (MedAdd) programme. The MedAdd programme aims to bridge the innovation chasm with the use of additive manufacturing for the innovation, development, and final manufacturing of medical devices by enhancing the current high-end equipment and capabilities at the university. This includes the development of a range of assistive devices, the post-processing of AM implants and the provision of training in medical device development.

Metal Casting Technology Station

The Metal Casting Technology Station (MCTS) at the University of Johannesburg supports the foundry industry with technology transfer and skills development through human resources and capacity development to improve the competitiveness of the foundries. The MCTS has assisted more than 50 foundries in the year under review through various interventions in collaboration with stakeholders such as the National Foundry Technology Network, the South Africa Institute of Foundryman and the Technology Localisation Implementation Unit at the CSIR.

Approximately 31 product and process improvements were completed for the clients of the MCTS to enhance the quality of products, with three prototypes developed and two technologies demonstrated as alternative material product compositions in support of the circular economy. The projects range from sand reclamation and sand-defect reductions to the development of heat-treatment processes and energy management.

The MCTS also hosts a satellite site of the Casting Simulation Network. This entails providing access to casting simulation software with the objective of scrap reduction, cost reduction, an improved product development cycle, and better product optimisation. In the year under review, a total of 74 tests and analyses were provided to South African foundry companies and suppliers.

An example of the services rendered to clients of the MCTS is the development of drill bits for use in coal mining. Drilling remains a vital operation in the coal-mining process regarding ore-body characterisation, surface and underground blast-hole drilling, underground roof and wall bolting, and cabling, dewatering, and degassing. In South Africa, suppliers of drill bits are limited as most companies have relocated their production and R&D efforts elsewhere in the world. To meet the local demand for coal-mining drill bits the MCTS has been providing technical and product development assistance to Dekhabu (Pty) Ltd, a female-owned company that provides roof-bolt drill bits to the South African coal-mining industry.

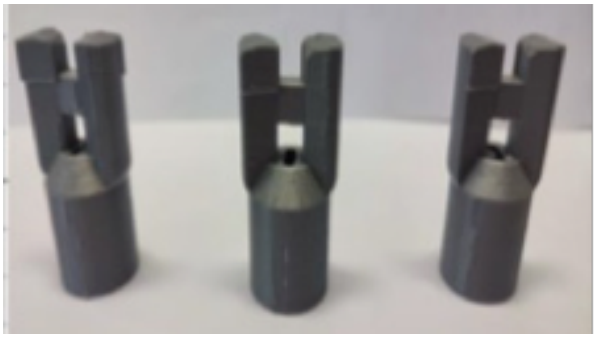


Figure 26: Prototype roof bolt drill bits for coal mining

Young Entrepreneurs Design Self-Service Document Certifying Machine

The Technology Station for Materials and Processing Technologies at the Vaal University of Technology in Sebokeng partnered with two of Gauteng's young innovative entrepreneurs to design a self-service certifying machine, dubbed 'e-Certify'. The self-certifying machine or prototype is a product that is intended to verify, certify, and use biometric scans to authenticate documents. The machine works by first scanning the original documents for verification and then certifying the copies.

The product has been developed to alleviate long queues at government institutions such as police stations and post offices, and aims to reduce the risk of personal documents being stolen and later used in fraudulent activities. The principal goal of the self-service certifying machine is to help the government, communities, human resources management, and the private sector to make sure that the documents are authentic.

Figure 27: The e-Certify self-certifying prototype

Locally Developed Silicone Prosthetic Liner for Limb Amputees

Located in Gqeberha at NMU, eNtsa is recognised as a prominent research, design,, and technology support unit for the advanced manufacturing sector in SA. eNtsa's main focus is to support and stimulate engineering innovation in order to improve the competitiveness of local manufacturers which will enable industry exploit and development of new markets.

Growing the manufacturing economy in SA holds the key to sustainable job creation and improved quality of life. This forms the drive of eNtsa to provide innovative research and advanced technical training for support to the local manufacturing industry according to international best practices.

eNtsa supported the development of prototype tooling, process development and testing for new locally developed silicone prosthetic liner for limb amputees. The aim of this project was for eNtsa to design and manufacture an aluminium prototype tool for manufacturing silicone prosthetic liners with Prosthetic Engineering Technologies.

Owing to the design and size, some mould components had to be produced in partnership with a local, Nelson Mandela Bay SME engineering workshop, promoting local capabilities and creating SME networks of support.

The innovator, Luvuyo Sume, founder of Prosthetic Engineering Technologies, uses a prosthetic and experienced challenges with the more prevalent imported prosthetic sleeves. His design, being local, will mean users of prosthetics can access these at a lower cost and jobs would be created in manufacturing. Since the successful prototyping, this project has been awarded funding by the SAMRC through the Medical Device and Diagnostics Innovation Cluster to pursue SAHPRA licensing and ISO 13485 certification.

Figure 28: Luvuyo Sume with a silicone prosthetic liner and the tooling for injection moulding the liners

Prosthetic liners exist to improve amputee safety and comfort by adding a cushioning layer between the residual limb and the prosthetic socket. Many choices of liner technology are available, and clinicians often rely on personal intuition and experience to choose the liners that are appropriate for patients. The availability and cost of imported sleeves limits access to South African patients, especially those from disadvantaged backgrounds.

A computer design was produced and manufacturing drawings generated for fabrication of the mould. The design was based on the successful 3D printed design used for early stage, rapid prototyping of a tool. From the initial 3D printed tool and prototype liners produced, a number of functionality updates to the design were implemented. Medical-grade silicone material was used to manufacture the product.

This is to express our gratitude for the technical assistance we received from eNTSA for the development of a locally produced silicone prosthetic liner. We as Prosthetic Engineering Technologies cannot thank TIA enough as this project was made possible in part through financial backing from the Technology Innovation Agency. We would like to express our gratitude to TIA for the financial assistance received through the TIA Technology Station.

"Additional funding [has been secured] as a result of [TIA's] assistance. We have been awarded funding from the South African Medical Research Council through their Meddic programme ... to localize the manufacturing of medical devices.

Luvuyo Sume,
MD: Prosthetics Engineering Technologies

INNOVATION SKILLS AND ENTERPRISE DEVELOPMENT

The ISED business unit aims to stimulate a culture of innovation thinking in the NSI, thus increasing the rate of translation of innovative ideas into novel technologies, products, and services. It provides focused and targeted training interventions to strengthen the entrepreneurial capacity of researchers and innovators towards the commercialisation of their research outputs.

The Southern Africa Innovation Support Programme is a regional initiative that supports the growth of new businesses by strengthening innovation ecosystems and promoting cross-border collaboration between innovation role-players in southern Africa. The second phase of the programme was supported by the Ministry for Foreign Affairs of Finland, in partnership with the ministries responsible for Science, Technology and Innovation of Botswana, Namibia, South Africa, Tanzania, Zambia, and the Southern African Development Community Secretariat.

Rubber Nano Products, one of TIA's investees, participated as the selected South African company in the programme. As a result of participating in the Soft-Landing Programme in Finland, the company's products have attracted significant commercial attention both in the Southern African Development Community region and in Finland through engagements with primary rubber and waste management companies, particularly concerning a large Finnish tyre manufacturing company.

The GCIP-SA forms part of a global initiative aimed at promoting "clean" or "green" technological innovations through supporting entrepreneurs to grow their SMMEs and start-ups into viable, investment-ready businesses. Green investments (investment activities which concentrate on companies that try to preserve natural resources) help to minimise SA's dependence on fossil fuels, which will in turn reduce air pollution and carbon emissions. Relevant sectors include bioprocessing, clean technology, and medical devices.

As a result of TIA's success in hosting and managing the GCIP-SA on behalf of the United Nations Industrial Development Organization, TIA has successfully secured a five-year extension of the partnership to implement phase two of the programme, with funding committed in the amount of R32 million. This will allow 200 start-up companies to be supported to accelerate cleantech innovation and entrepreneurship in support of the transition towards a circular economy and the creation of green jobs.

STRATEGIC PARTNERSHIPS AND STAKEHOLDER RELATIONS

Business Development

SA's Just Energy Transition is an Eskom-led initiative valued at R135 billion which entails repurposing and repowering power stations. The initiative seeks to transition the organisational operations towards cleaner energy production, while ensuring the socio-economic aspects of those directly affected are adequately addressed to mitigate potential unintended consequences in the aftermath of coal-fired power plant decommissioning.

Through a standing collaboration agreement between TIA and Eskom, two TIA-funded technologies valued at R7 million have been deployed for demonstration and early adoption, namely, the MushMag mushroom dome (an almost failure-proof way of growing exotic mushrooms for local and export markets) and Gravel Barrel Aquaponics (which combines fish farming and vegetation/crop farming) systems. Deployment took place at Komati Power Station, the Just Energy Transition flagship site, under the Agrivoltaics Repurposing thrust. Agrivoltaics entails combining repowering brought by solar PV and battery storage with agricultural activities underneath and alongside the PV array. These technologies were demonstrated in October and November 2021, showcasing the potential of the systems for sustainable agricultural activity that will ensure community involvement through knowledge transfer and either part-ownership or a rental scheme.

Industry Matching Fund Programme

TIA's Industry Matching Fund is a risk-sharing, blended financing instrument for co-investment and follow-on funding with other private- and public-sector funding entities of technological innovation projects. It seeks to accelerate the commercialisation of local technological innovations through funding support and non-financial support such as incubation and assistance with market access and penetration. All funds in the Industry Matching Fund structure submit independent reports and financials, hold regular investment committee meetings, and are supported by advisory boards. TIA is represented in all the funds.

The Industry Matching Fund continues to grow as a successful catalytic finance and fundraising instrument. As at 31 March 2022, the fund had invested in 24 projects, of which 50% originate from TIA's de-risked project portfolio, with more than 60% of the projects involving publicly funded IP. Nine of these projects have been commercialised to date. Approximately R500 million has been leveraged against R28 million in TIA funds at fund level and approximately has been R1 billion leveraged at the project level. Twelve companies have been created as a result of Industry Matching Fund investments and 76 jobs created.

In the period under review, the fund recorded two significant developments. First, the SAB Foundation joined as a partner, contributing R28.6 million. The SAB Foundation as a market-facing entity, through its Enterprise Development and Endowment Fund, has been secured as a co-funding and business development partner to accelerate TIA venture-creation efforts. This first of its kind initiative represents TIA's entry to building relationships with actors in the corporate venture capital industry.

Secondly, the SA SME Fund has invested an additional R25 million in the UTF. The Industry Matching Fund has also proven its utility in helping TIA to deploy the Innovation Fund, with a R10.5 million allocation into the UTF alongside the SA SME Fund's contribution.

14.3.4 BUDGET AND EXPENDITURE

A comparison of the budget and actual expenditure for the Innovation Enabling Division is presented in Table 11.

Table 11: Budget and expenditure for the Innovation Enabling Division for 2020/21 and 2021/22

	2020/21			2021/22		
Sub-programme	**Budget (R'000)**	**Actual Expenditure (R'000)**	**(Over)/under Expenditure (R'000)**	**Budget (R'000)**	**Actual Expenditure (R'000)**	**(Over)/under Expenditure (R'000)**
Youth Technology Innovation Programme	–	775	(775)	1,599	1,599	–
ISED	1,350	2,686	(1,336)	1,581	3,166	(1,585)
TSP	92,442	114,354	(21,912)	91,019	107,263	(16,244)
IID	20,000	13,217	6,783	29,000	12,985	16,015
GCIP-SA	2,925	2,623	302	3,380	1,023	2,357
SFP	20,000	8,769	11,231	12,000	25,263	(13,263)
Total	**136,717**	**142,424**	**5,707**	**138,579**	**151,299**	**(12,720)**

15. SPECIAL FOCUS: IMPLEMENTATION OF THE INNOVATION FUND

DSI has established an Innovation Fund that will enhance SA's capacity to commercialise technological innovations. TIA is one of the implementing partners alongside the SA SME Fund, the Public Investment Corporation and the IDC. This R150 million public–private funding instrument aims to facilitate and accelerate commercialisation. In 2020/21, TIA received an amount of R80 million, with 87.5% of this successfully committed to approved projects and R25.2 million disbursed to project recipients.

TIA concluded agreements with nine projects under the Bioeconomy portfolio by the end of 2021/22. These included six IKS-related projects with a total value of R40.5 million under the NIPP Fund. The fund involves a partnership with the IDC and was established to advance the development and commercialisation of indigenous knowledge. A total of R31.4 million was disbursed to projects in the year under review.

For the Commercialisation portfolio, TIA concluded agreements with five projects (Pelebox, Riot and Lepsta in the ICT portfolio and Settlebed detector and Smartsensor in the Natural Resources portfolio) totalling R21.5 million, with R15.9 million disbursed in the year under review. In addition, a further R10.5 million was disbursed to the UTF. In total, 72% of the division's first-round fund allocation (spanning 2020/21 and 2021/22) has been disbursed, with further disbursements expected in early 2022/23 based on the achievement of milestones.

TIA is pleased that it has been entrusted with a further R102.2 million to implement round two of the Innovation Fund based on a significant investable project pipeline. Lessons were learnt while implementing round one of the Innovation Fund, with TIA now afforded more flexibility and agility in project selection in round two. TIA is therefore confident it will be able to ensure rapid implementation of the Innovation Fund in 2022/23. Several noteworthy project successes emerged from round one of the Innovation Fund.

HIGHLIGHTS

Stone Three

Stone Three solves real-time measurement problems with industrial AI-augmented machine vision and remote AI-augmented process monitoring and diagnostics, improving the efficiency of minerals processing. This is achieved through its Smart Sensor Process Advisory Dashboard. With R5.5 million in Innovation Fund support, Stone Three has grown internationally with projects in Chile, Australia, SA and Europe. It is also the preferred supplier of sensor technologies for Anglo American worldwide. Its royalty payments to TIA have increased from R100,000 in 2020 to R770,000 in 2021, with projections of R1.5 million in 2022. The company has created 48 jobs and has also attracted black equity ownership of 12.8%.

Technovera

Technovera's Internet of Things-enabled Pelebox Smart Lockers system is a social inclusion health technology solution that improves efficiency in last-mile access for medication in public healthcare. The system significantly reduces the average collection time for patients on repeat (chronic) medication by automating the scheduling of medication collections, eliminating queues in public healthcare facilities. The 100% black-owned company received R2.5 million in funding out of a contracted R5 million from the Innovation Fund. With TIA's support, the company has expanded into Namibia in collaboration with the Namibian Ministry of Health and Social Service and has generated significant sales in 2021 and 2022.

RIOT

RIOT is a wireless technology innovation platform that will enable households and small businesses to crowdsource network infrastructure and deploy network devices for serving their private internet access needs. With support from the Innovation Fund, RIOT established a second pilot in the south of Johannesburg in collaboration with the national broadcast signal distributor, SENTECH. RIOT has been inducted into SENTECH's Research and Innovation Network Partnership to expand its technology product within Sentech's infrastructure. The collaboration serves to demonstrate the synergy between the public entity and the start-up enterprise, providing annex technology that will infuse advancement in the 5G domain and will see the technology being piloted further in township communities.

LEPSTA

LEPSTA developed a software development platform named Spacedecode, a version control and self-managed software development platform that enables collaboration and real-time sharing of source code between software developers. Through the innovation fund, Lepsta has managed to implement an apprenticeship programme successfully in partnership with the WeThinkCode academy and to scale up activities on its platform. LEPSTA has successfully raised follow-on funding from the IDC to commercialise its software development platform.

University Technology Fund

As part of TIA's efforts to expand the reach and impact of the Innovation Fund, the Agency has partnered with the UTF to bolster its capacity to support the commercialisation of publicly funded IP. The funding allocated to the UTF is specifically intended to expand the fund's reach towards previously disadvantaged institutions.

The UTF was established to bridge the gap between the research and commercialisation stages, specifically to facilitate the commercialisation of technology from SA universities. The fund exists to respond to the two primary challenges in this regard, being inadequate pre-Seed and Seed funding, and inadequate Series Seed and Series A funding. In the year under review, the Innovation Fund provided supplementary funding in the amount of R10.5 million to the UTF.

PART C

Governance

TIA was established by, and derives its mandate from, the TIA Act (Act 26 of 2008, as amended) (the TIA Act). TIA is a schedule 3A public entity under the provisions of the PFMA (Act 1 of 1999). The objective of the Agency in terms of the TIA Act is to support the state in stimulating and intensifying technological innovation to improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations.

16. PORTFOLIO COMMITTEE

TIA is accountable to Parliament through the Parliamentary Portfolio Committee on Higher Education, Science and Innovation. The Portfolio Committee exercises oversight over TIA with the emphasis on service delivery and enhancing economic growth.

During the year under review, TIA appeared before the Portfolio Committee once, on 1 June 2021. TIA's presentation provided an overview of the organisation's Strategic Plan for the period 2020–2025 in addition to its 2022/23 APP and Budget. The presentation looked back at the first year of implementation of the Strategic Plan 2020–2025 and included highlights of TIA's 2020/21 financial performance with reference to matters such as Commercialised Innovations, delivering on the Bio-economy strategy, SMME support, partnerships, and its response to the COVID-19 pandemic.

17. EXECUTIVE AUTHORITY

Oversight by the Executive Authority rests on the prescripts of the PFMA. The Executive Authority has the power to appoint and dismiss the Board of a public entity. The Executive Authority must ensure that Board members having an appropriate mix of skills are appointed to guide the public entity.

The Executive Authority is accountable to Parliament for achieving the goals and objectives of TIA. The Executive Authority takes an interest in risk management to the extent necessary to derive comfort that properly established and functioning systems of risk management are in place to protect TIA against significant risks. As risk management is an important tool to support the achievement of this goal, it is important that the Executive Authority provides leadership to governance and risk management.

TIA's Executive Authority is the Honourable Minister of Higher Education, Science and Innovation, Dr Bonginkosi Emmanuel Nzimande.

The following statutory reports were submitted to the Executive Authority:

- 2021/22 Quarter 1 Performance Report (20 July 2021)
- 2021/22 Quarter 2 Performance Report (20 October 2021)
- 2021/22 Quarter 3 Performance Report (20 January 2022)
- 2021/22 Quarter 4 Performance Report (20 April 2022)
- 2020/21 Annual Report (27 August 2021)
- Revised final 2022/23 APP (11 February 2022)

Furthermore, a PFMA section 54 ad-hoc request for approval for the Marula Value Chain project was submitted to the Executive Authority on 17 August 2021.

18. ACCOUNTING AUTHORITY

TIA's accounting authority is the TIA Board. The term of the previous TIA Board – which was appointed by the former Minister of Science and Technology, Ms Naledi Pandor, on 1 May 2017 for a period of four years – was extended by the current Minister of Science and Innovation, Dr Blade Nzimande in terms of section 8(4) of the TIA Act for a period of 6 months or until the appointment of the new Board was finalised, whichever came first. The extension came into effect on 1 May 2021 and was effective until the end of October 2021. A new Board was appointed by the Minister with effect from 1 November 2021.

In terms of section 5 of the TIA Act, the Board is responsible for managing and controlling the Agency. Board members are appointed by the Minister on the grounds of their knowledge and experience in technological innovation, technology management, IP and its commercialisation, and business skills which, when considered collectively, should enable them to attain the objects of the Agency.

The Board considers the practice of good corporate governance as a fundamental component contributing to the success of TIA's business. In the pursuit of and in its commitment to the highest standards of governance, the Board provides strategic oversight and effective direction by adhering to the relevant codes of best practice and principles of fairness, integrity, responsibility, accountability and transparency.

18.1 BOARD CHARTER

A Board Charter is in place which sets out the roles and responsibilities of the Board in relation to the Agency and governs the conduct of the Board. The Board Charter is central to determining the way in which the Board interacts with management, the shareholder, and other stakeholders. In addition, Board members' responsibilities and limitations are primarily set out in the TIA Act, the PFMA, the King reports on Corporate Governance, and the common law of SA.

The Board is responsible for:

- acting as the focal point for, and the custodian of, corporate governance by managing its relationship with management, the shareholder and other stakeholders of the Agency along sound corporate governance principles;
- providing effective leadership on an ethical foundation;
- appreciating that stakeholders' perceptions affect the Agency's reputation;
- adoption of strategic plans;
- appointing a suitably skilled and qualified person as the CEO of the Agency, which appointment must be made after following a transparent and competitive selection process;
- retaining full and effective control over the Agency, and monitoring management in implementing Board plans and strategies;
- monitoring of operational performance and management;
- ensuring that the Agency complies with all relevant laws, regulations and codes of business practice;

- ensuring that the Agency communicates with its internal and external stakeholders openly and promptly, and with substance prevailing over form;
- developing a code of conduct that anticipates and deals with conflicts of interest, particularly relating to Board members and management;
- ensuring that there is an appropriate balance of power and authority on the Board, such that no individual or select individuals can dominate the Board's decision-making;
- defining and monitoring the information needs of the Board;
- identifying and monitoring the non-financial aspects relevant to the business of the Agency; and
- through its sub-committees, prioritise and manage risks which seek to impede the business of TIA.

18.2 COMPOSITION OF THE BOARD

As indicated above, the term of the TIA Board came to an end at the end of October 2021 after previously having been extended for a period of six months. The Executive Authority appointed a new Board effective 1 November 2021. Three Board members were reappointed, namely, Mr Butana Mboniswa, Ms Sebenzile Matsebula, and Mr Thabiso Ramasike. Ms Matsi Modise was appointed as Board Chairperson.

Table 12 provides a detailed list of TIA Board members.

Table 12: TIA Board members and their particulars

Full Name and Designation	Effective Dates of Appointment and Resignation	Qualifications	Area of Expertise	Board Directorships	Other Committees or Task Teams
Ms Bonolo Matshidiso Modise (Chairperson)	1 November 2021 to date	B Com (Marketing and Advanced Management) Financial Insights for non-financial directors AltX Director Induction Programme (IODSA)	Venture Capital (early stage investment experience) Technology entrepreneurship Strategy Business Development Governance	Furaha Afrika Holdings (Pty) Ltd Finclusion (Pte) Ltd SiMODiSA Start-Up Gauteng Gambling Board Kuehne + Nagel SA SAB Foundation (Trustee) Metropolitan Momentum Holdings ESD Trust (Trustee)	Agri-Vie Private Equity Fund (Advisor) SA Venture Capital & Private Equity Association Google Africa Launchpad Programme (Business Mentor) Endeavor SA Trust (Mentor) World Economic FORUM – global shaper Young Presidents Organisation – Member
Mr Butana Andrew Mboniswa (Interim Chairman until 31 October 2021)	8 August 2019 to date	MSc Biochemistry BSc (Hons) Biochemistry LLB Certificate Financial Modelling and Analysis	Executive Leadership Investment Management Technology Management Technology Development Business Development Global Systems of Innovation SME Incubation	Inqaba Biotechnical Industries (Pty) Ltd The Innovation Hub Management Company (Pty) Ltd Sereko Technology & Innovation Advisors	Member: Gauteng Growth and Development Agency (GGDA) Infrastructure, Group Trade and Investment Committee
Mr Lesejane Patrick Krappie (Acting CEO and ex officio Board member)	13 June 2020 to date	BCom (Hons) Economics	Economic policy, International diplomacy & negotiation, Collaborative leadership, Stakeholder management, Partnership building, Strategy & execution	None	Member: Innovation Challenge Pilot Project Steering Committee, Co-Chair: IID Steering Committee, Member: Afrique du Sud Steering Committee
Ms Anati Judith Canca (member)	1 November 2021 to date	BSc (Microbiology) BSc (Hons) (Human Genetics) MSc (Technology Development) Coaching for Development	IP Management Strategy formulation and execution of innovation strategies for revenue generation Commercialisation Leadership and Executive Coaching	Malangana Innovation Advisory (Pty) Ltd Mazangani Solutions (NPC)	Associate: Nurturing Growth Trading (Pty) Ltd

Table 12: TIA Board members and their particulars (continued)

Full Name and Designation	Effective Dates of Appointment and Resignation	Qualifications	Area of Expertise	Board Directorships	Other Committees or Task Teams
Dr Revel Iyer (member)	1 November 2021 to date	BSc BSc (Hons) MSc PhD (Botany) LLB LLM (IP) MBA	Technology Transfer IP Management Technology Innovation Technology Commercialisation Biotechnology	Aonyx Holdings Aequorea Aonyx Foods Promerops	None
Dr Stephen John Lennon (member)	1 May 2017 to 31 October 2021	PhD (Eng) MSc (Eng) BSc	Business development, Energy, Technological innovation	Shanduvan (Pty) Ltd, Yamatji Southern Regional Corporation Ltd, Yamatji Enterprises Ltd, Murujuga Commercial Ltd	None
Dr Mziwandile Madikizela (member)	1 May 2017 to 31 October 2021	PhD Biochemistry MSc Biochemistry MBA BSc Hons Biochemistry Certificate in Technology Management Executive coaching, Certificate in Programme Leadership Coaching	Consultant: STI, Executive coach, Technology management research, Commercialisation, Innovation management, Regional innovation systems, Molecular parasitology, Cancer research, Clinical trials	SAMRC, Stellachem, Razocure Medical Products	Member: Audit Committee SAMRC, Expert panel member for NACI STI Indicator Report, Extra-ordinary Senior lecturer at Graduate School of Technology Management (UP)
Ms Edith Lindiwe Matlali (member)	1 November 2021 to date	B Com (Economics and Statistics) Foundation Programme for Private Equity (GIBS) Graduate Certificate Innovation and Entrepreneurship Graduate Certificate Social Entrepreneurship	Techno-Entrepreneurship Social Entrepreneurship Business development, Social justice & Human rights, Disability mainstreaming, Governance, Leadership, Statistics & Scientific research	Africa Teen Geeks National Financial Aid Scheme Apodytes (Pty) Ltd	Presidency (Commissioner 4IR)
Ms Joy Sebenzile Patricia Matsebula (member)	1 May 2017 to date	MSc Biometrics BSc Natural Sciences, Environmental Sciences & Biometrics	Information Technology, Market research, Product management, Commercial property	Dempower, Divuseni Trading and Investments, ICT SMME Chamber, Johannesburg International Airport, Kuzuko Lodge, Lanseria Airport 1993, Lanseria Airport Investments, Lanseria Holdings, Lanseria International Airport, Lindandanda Consulting Investments & Trading, Motswako Office Solutions, Ngwedi Investment Managers, Petatex, Taquanta Securities, Taquanta Asset Managers, Taquanta Investment Holdings	Centre for Alternative & Augmentative Communication, Disability Economic Empowerment Trust, First Rand Foundation, South African Development Trust for Disabled People, Presidential Working Group on Disability, The Sebenzile Matsebula Foundation

Table 12: TIA Board members and their particulars (continued)

Full Name and Designation	Effective Dates of Appointment and Resignation	Qualifications	Area of Expertise	Board Directorships	Other Committees or Task Teams
Dr Patience Lethabo Mlengana (member)	1 May 2017 to 31 October 2021	PhD in Leadership & Management Masters Degree in Information Science Honours Degree in Information Science Postgraduate Diploma in Information Science BA in Social Sciences	Information Technology, Market research, Product management, Commercial property	Tshahani Resources, Century Property Estates, Angels City, PWM Technologies, Nyathela Consulting 2, Mhlari Kulaleni Agricultural Primary Co-Operative Ltd, Inqubela Agricultural Co-Operative Ltd, Zakele Consulting, F Cubed SA, Cyclo Capital, PMM Property Holdings, Vi Women's Investments	None
Mr Thabiso Gerald Ramasike (member)	1 May 2017 to date	BCom BANKSETA International Executive Development Senior Executive Leadership Development Programme Certified Associate (CAIB (SA))	Business Investing Strategy Governance Public speaking Executive Coaching Community Leadership Philanthropy	Tuleka Group (Pty) Ltd Kwena Fund Managers (Pty) Ltd Kwena Franchise Fund (Pty) Ltd Eic Wealth Investors (Pty) Ltd Ramasike Investment Club (Pty) Ltd Thabiso Ramasike Investments (Pty) Ltd Villa De Rama (Pty) Ltd Thatir Group (Pty) Ltd Willrod Holdings (Pty) Ltd Tshepe Foundries International (Pty) Ltd Mes Mould Empower Serve NPC African Unity Life Ltd	Member: Audit and Risk Committees of South African Revenue Service and African Unity Insurance Ltd Chairperson: Audit and Risk Committee of MES Chairperson: Social, Ethics, Transformation & Sustainability Committee of African Unity Insurance Ltd
Dr Jan van de Loosdrecht (member)	1 May 2017 to 31 October 2021	PhD Chemistry MSc Chemistry MBA	Technology innovation, Technology management, Technology development, Technology commercialisation, IP	None	None

The Board convened for a total of eight meetings during the period under review. The dates of the meetings and Board member attendance are provided in Table 13.

Table 13: Board dates of meetings and attendance record

Member	No. of Meetings Attended	19/4/2021	28/5/2021	16/7/2021	27/8/2021	27/10/2021	3/2/2022	28/2/2022	9/3/2022
Ms Bonolo Matshidiso Modise (Chairperson)	3	–	–	–	–	–	●	●	●
Mr Butana Andrew Mboniswa (Interim Chairman until 31 October 2021)	6	●	●	●	●	●	●	●	●
Ms Anati Judith Canca	2	–	–	–	–	–	●	●	●
Dr Revel Iyer	3	–	–	–	–	–	●	●	●
Mr Lesejane Patrick Krappie	8	●	●	●	●	●	●	●	●
Dr Stephen John Lennon	5	●	●	●	●	●	–	–	–
Dr Mziwandile Madikizela	5	●	●	●	●	●	–	–	–
Ms Edith Lindiwe Matlali	3	–	–	–	–	–	●	●	●
Ms Joy Sebenzile Patricia Matsebula	8	●	●	●	●	●	●	●	●
Dr Patience Lethabo Mlengana	1	●	●	●	●	●	–	–	–
Mr Thabiso Gerald Ramasike	7	●	●	●	●	●	●	●	●
Dr Jan van de Loosdrecht	5	●	●	●	●	●	–	–	–

Legend
● In attendance
● Not in attendance

The Board has recognised the relevance and significance of TIA's role in the NSI, and has prioritised commercialisation, implementation of the Bio-economy Strategy, and support to SMMEs and cooperatives for the successful implementation of TIA's mandate.

18.3 COMMITTEES

TIA's Audit and Risk Committee (A&RC),[15] Investment and Finance Committee (IFC) Human Resources and Remuneration Committee (HR&REMCO) and Board Technical Committee have been tasked with specific responsibilities in order to attend to the matters of the Board effectively.

18.3.1 AUDIT AND RISK COMMITTEE

The A&RC is constituted in terms of section 77 of the PFMA, read with Chapter 27 of the Treasury Regulations. The A&RC assists the Board in discharging its duties relating to the safeguarding of assets, the operation of adequate systems, control processes, and the preparation of accurate financial reporting and statements in compliance with all the applicable legal requirements, accounting, and auditing standards. The ethical function of a Social and Ethics Committee as envisaged in the Companies Act 71 of 2008 is incorporated in the Terms of Reference of the A&RC.

During the reporting period, the Committee monitored the effectiveness of TIA's internal controls, governance and compliance with its risk management framework. A combined assurance plan was approved to ensure that the Agency adopts a co-ordinated approach to all assurance activities. While several material risks emerged, no internal or external audit findings have come to the attention of the committee to indicate that any material breakdown of internal controls occurred during the year under review.

[15] The Audit and Risk Committee is normally abbreviated to 'ARC' in the TIA environment. However, to avoid confusion with the broadly used acronym of ARC for the Agricultural Research Council in the South African NSI, the Audit and Risk Committee is abbreviated as 'A&RC' in this report.

The Committee convened for a total of seven times during the period under review, as shown in Table 14.

Table 14: A&RC dates of meetings and attendance record

Member	No. of Meetings Attended	14/4/2021	17/5/2021	21/5/2021	12/7/2021	18/8/2021	18/10/2021	15/2/2022
Mr Thabiso Gerald Ramasike (Chairperson)	7	●	●	●	●	●	●	●
Mr Butana Andrew Mboniswa	1	–	–	–	–	–	–	●
Dr Stephen John Lennon	5	●	●	●	●	●	●	–
Ms Edith Lindiwe Matlali	1	–	–	–	–	–	–	●
Dr Jan van de Loosdrecht	5	●	●	●	●	●	●	–

Legend
● In attendance
● Not in attendance

18.3.2 INVESTMENT AND FINANCE COMMITTEE

The IFC provides oversight and advice to the Board on issues central to the Board's core mandate. The committee makes funding decisions in pursuit of TIA's mandate and strategic objectives within the specific thresholds determined in and guided by the Investment Framework Policy, as prescribed by Section 5(3) of the TIA Act.

The IFC considers investment proposals where TIA's exposure per project is above R15 million but below or equal to R30 million; and it oversees the management of financial resources within its delegated authority. The committee further considers ad hoc matters as delegated to the committee by the Board from time to time.

During the reporting period, the committee approved an amount of R10.5 million towards the UTF. The Fund has a seed facility which was previously exposed to Stellenbosch University and the University of Cape Town, whereas the other funding rounds from Series Seed to Series A were open to all South African universities. The seed facility has since been opened to other universities. With the SA SME Fund's additional investment of R25 million, the UTF has the ability to invest into a number of early-stage seed deals from technology and IP that originate from all South African universities.

Furthermore, the committee recommended the development of mycotoxin field screening tools to the Board for an amount of R23,471,144. The project will deliver four complementary technologies/products, namely, the mycotoxin lateral flow test kit, recombinant mycotoxin monoclonal antibodies, mycotoxin standards and microsphere beads. The products are positioned to resolve food safety issues and, in particular, quality control issues on food and feed commodities, especially at export markets. The lateral flow kit for mycotoxin testing is positioned to have a great social impact because it will enable small-scale and commercial farmers to conduct quality control at production sites.

The Committee convened for a total of four times during the period under review, as shown in Table 15.

Table 15: IFC dates of meetings and attendance record

Member	No. of Meetings Attended	14/5/2021	13/8/2021	27/10/2021	17/2/2022
Mr Butana Mboniswa (Chairperson)	3	●	●	●	●
Dr Stephen Lennon (Chairperson until 31 October 2021)	3	●	●	●	–
Dr Revel Iyer	1	–	–	–	●
Ms Lindiwe Matlali	1	–	–	–	●
Ms Bonolo Matshidiso Modise	1	–	–	–	●
Dr Mziwandile Madikizela	1	●	●	●	–

Legend
● In attendance
● Not in attendance

18.3.3 HUMAN RESOURCES AND REMUNERATION COMMITTEE

The HR&REMCO derives its authority from the Board and was established in order to oversee and provide advice to the Board on issues central to TIA's human resource capability, design and strategy as well as remuneration and succession planning.

The Committee is responsible for ensuring that TIA develops a framework, policies, guidelines and an environment that allows the Agency to employ, reward and retain dedicated, motivated, efficient and loyal employees so as to achieve TIA's long-term strategic goals. The social functions of a Social and Ethics Committee as envisaged in the Companies Act 71 of 2008 are incorporated into the Terms of Reference of the HR&REMCO, dealing with matters such as environment, health and safety, consumer relationships, labour and employment.

During the period under review, the Committee drove the design of the Corporate Balanced Scorecard for 2021/22, aligned with the APP to ensure that strategic objectives are cascaded into individual performance agreements, ensuring strategic alignment. Various training initiatives were implemented, based on the Personal Development Plans. TIA also completed the Succession Planning Framework. Two changes were made to TIA's structure, within the Acting CEO's delegation of authority, to be implemented as of 1 April 2022. The first change was to amend the reporting line for Risk Management from the CEO to the Chief Financial Officer (CFO). This reduces the span of control for the CEO. The second change was to incorporate the Monitoring and Evaluation function into the Strategic Planning and Reporting Business Unit. The Committee also approved revisions to the TIA's Code of Conduct, Leave Policy, Training and Development Policy, Performance Management Policy and Reasonable Accommodation Policy.

The Committee convened for a total of six times in the period under review, as shown in Table 16.

Table 16: HR&REMCO dates of meetings and attendance record

Member	No. of Meetings Attended	11/5/2021	27/5/2021	11/8/2021	18/10/2021	14/2/2022	23/2/2022
Ms Joy Sebenzile Patricia Matsebula (Chairperson)	6	●	●	●	●	●	●
Ms Anati Judith Canca	2	–	–	–	–	●	●
Dr Mziwandile Madikizela (resigned 19/04/2021)	0	–	–	–	–	–	–
Dr Patience Lethabo Mlengana	2	●	●	●	●	–	–
Mr Thabiso Gerald Ramasike	6	●	●	●	●	●	●

Legend
● In attendance
● Not in attendance

18.3.4 BOARD TECHNICAL COMMITTEE

The purpose of the Board Technical Committee is primarily to provide high-level strategic and technical advice to the Board and management of TIA. The committee may also consider matters of a technical nature which relate to other aspects of TIA's mandate, in fulfilling its goals of supporting the commercialisation of technological innovations, increasing infrastructure access for technology development, and stimulating an agile and responsive NSI. The committee considers matters which may be referred to it by the Board or presented to it by the management of TIA. It has a strategic advisory function and does not have powers to approve transactions. Where relevant, the committee must operate within the specific thresholds determined by the Delegation of Authority Framework as approved by the Board.

Owing to restrictions placed on the number of committees Board members may serve on in terms of the amended TIA Act, and given that TIA currently has the minimum number of legislated members appointed to the Board, the Board Technical Committee could not function during the period under review. It is, however, anticipated that the committee will become fully functional after completion of the Ministerial Review of TIA. A process is currently underway to assess the function and implementation of the committee.

18.4 REMUNERATION OF BOARD MEMBERS

Board members receive fees for services they render to the Board and the executive authority in accordance with the relevant tariffs as determined by National Treasury. These fees are regulated and updated from time to time and approved by the Minister. All Board members' travel costs in relation to executing their duties as TIA Board members, such as airfares and car hire, are paid for by TIA. Board members are also reimbursed for incidental expenses such as airport parking, toll fees and transfer fares. For the use of their personal vehicles in conducting TIA's business, members are reimbursed per kilometre as permitted by TIA's travel policy. The breakdown of each member's remuneration is presented in note 27 (members' emoluments) of the AFS, presented in Part E.

19. RISK MANAGEMENT

19.1 GOVERNANCE

The Board has overall responsibility for risk management, ensuring that it is embedded in all the processes and activities of TIA. This approach ensures that TIA takes a holistic view of the risks inherent in its strategy, operations, and business and that the management of risks is embedded in the planning, business, and decision-making processes in accordance with the approved Enterprise Risk Management Policy and Strategy.

The A&RC provides an oversight role regarding the effectiveness of TIA's risk management process, which is integrated with and central to its strategic planning process. TIA's Executive Management is accountable for designing, implementing, and monitoring the process of risk management, and for integrating it into the Agency's day-to-day activities.

As part of enhancing support for the risk management function, TIA established an internal Risk Management Steering Committee that is the key role-player in maturing the risk function in the combined assurance approach.

19.2 RISK CATEGORIES

TIA manages risks at three levels, namely, strategic, operational, and projects.

Strategic risks are those that are most consequential to TIA's ability to execute its strategy and achieve its constitutional mandate. These risk exposures can ultimately affect TIA's shareholder value and long-term sustainability.

Operational risk refers to those inherent in TIA's operations and processes. They are introduced by internal factors (such as Human Resources, Legal and Compliance, Fraud) and external factors (such as suppliers, politics, the economic climate, etc.).

Project risk refers to risks that could hinder the progress, result, or outcome of a specific project funded by TIA. They would result in deviations in expected returns on a project or affect the planned outcomes of specific value-creating initiatives.

19.3 STRATEGIC RISKS

Strategic risks that could affect business operations are approved by the Board and monitored throughout the year, and adjustments made as issues emerge. The TIA Board and the Executive Committee continuously review the principal risks to ensure an appropriate understanding of the overall operating environment. In total, seven strategic risks and 15 root causes were identified and are listed in Table 17.

Table 17: Strategic risks and associated root causes

Strategic Risk	Root Cause
Inability to deliver on the strategy	• COVID-19 pandemic restrictions and impact of emerging variants. • Possible lack of continuity of the Board. • Strategic imperatives do not embrace inclusiveness. • Funding/product instruments do not address systemic challenges within NSI. • Ministerial Review not finalised.
Possible misalignment between TIA and the DSI	• TIA Strategy not aligned to the Decadal plan. • Key deliverables/measurements from a shareholder perspective not fully defined.
Negative stakeholder sentiment	• Poor stakeholder management as a result of poor communication.
Possible budget cuts	• Inadequate service to stakeholders due to long turnaround times.
Inadequate performance of investment portfolio	• Poor/prolonged economic conditions and fiscal pressures. • Inadequate post investment monitoring. • Unethical conduct by investees
Lack of optimal organizational capability	• Loss of critical skills required within the organisation/inability to attract talent. • Inadequate/insufficient processes and systems.
Cyber Security threats	• Virus infection and illegal network access.

Figure 29 reflects the inherent risk and residual risk rating per risk cause after taking existing controls into account.

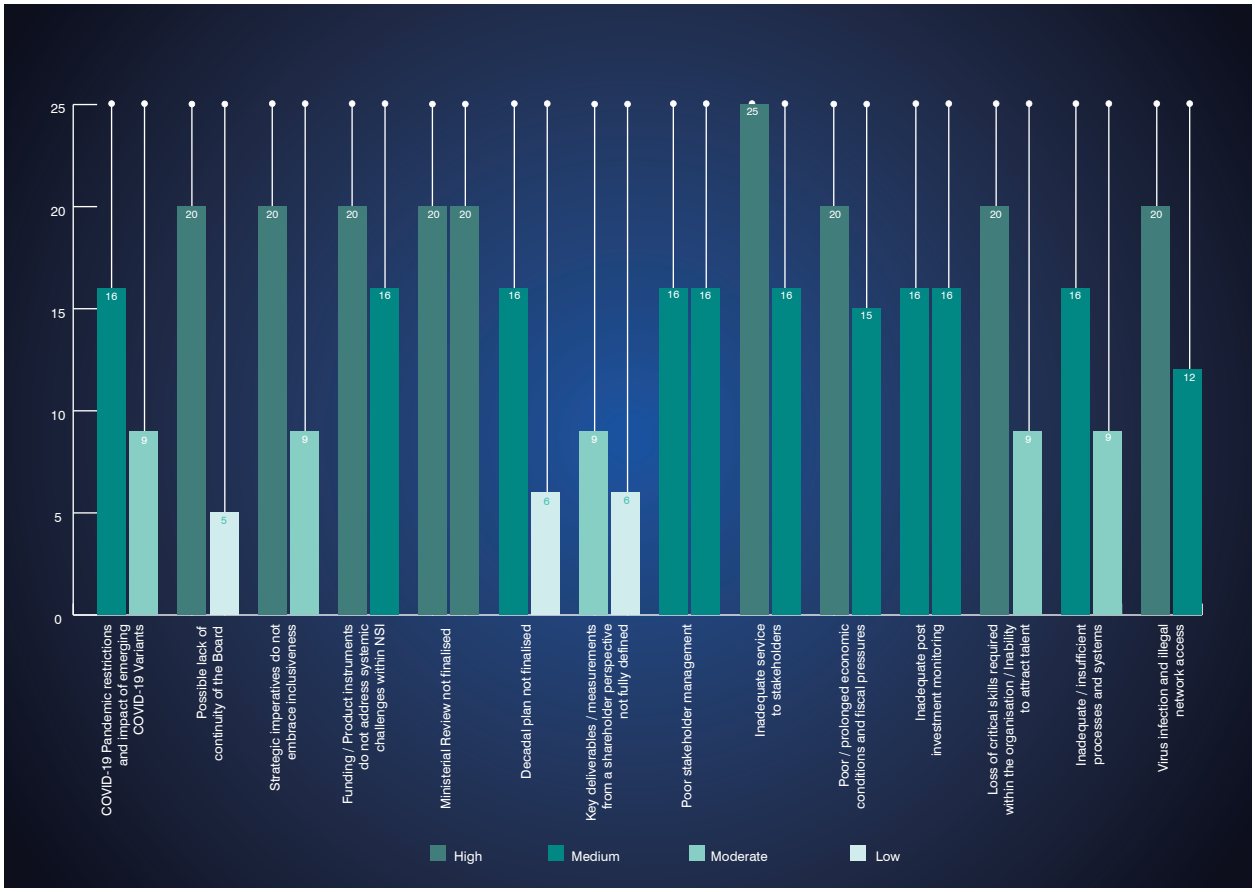


Figure 29: TIA's strategic risks - inherent risk (left bar) vs. residual risk (right bar)

19.4 RISK MANAGEMENT

At a strategic level, the risk management functions performed by the Board, Executives and management include

- the definition of risk;
- determining risk appetite;
- formulating strategies and policies for managing risk; and
- developing adequate strategies and policies for managing risk and developing adequate systems and controls to ensure that overall risk remains within an acceptable level.

Enterprise risk management, which encompasses operational risk, is managed by the Risk function. Enterprise risk management activities are performed by the relevant business units and are entrenched through adherence to operational procedures and guidelines set by management. Operational risk management strategies and policies are used in conjunction with delegated powers of authority, which detail the authority levels for various transactions.

Project risk assessments are performed to identify key risks that could affect the progress, result, or outcome of a specific project and any actions that are designed to mitigate adequately the risks identified and then put in place. The implementation and effectiveness of planned actions are monitored throughout the duration of a project.

20. INTERNAL CONTROL UNIT

While the Agency does not have a separate Internal Control unit, TIA's management has established and maintained an effective system of internal controls. The objectives of the system of internal control are to ensure that:

- risks are properly managed;
- assets are safeguarded;
- financial and operational information is reliable;
- operations are effective and efficient; and
- laws, regulations and contracts are complied with.

Internal Audit assesses whether the internal controls upon which management relies to mitigate the risks to acceptable levels are appropriate and functioning as intended; and it develops recommendations for the enhancement of or improvements in TA's overarching control environment.

21. INTERNAL AUDIT

21.1 PURPOSE AND OBJECTIVES

It is a requirement of the PFMA that an Internal Audit function must exist for all public entities. The primary objective of the Internal Audit function is to provide management, the A&RC, and the Board with an independent and objective level of assurance. By partnering and collaborating with management, this assurance is designed to add value and improve TIA's operations, its internal control environment, and its risk management and governance processes. In addition, Internal Audit helps TIA to accomplish its objectives by bringing a risk-based, systematic and disciplined approach to evaluating and improving the effectiveness of risk management, internal control, and governance processes.

The Internal Audit function remains in-house and the unit has maintained its independence by reporting functionally to the A&RC and administratively to the CEO. The unit has established processes and procedures supported by a sound internal audit methodology. The purpose, authority, and responsibility of Internal Audit are encapsulated in the Internal Audit Charter, which is approved periodically by the A&RC.

21.2 KEY INTERNAL AUDIT ACTIVITIES

The primary scope of the Internal Audit function is to provide TIA with an independent capability to perform assurance audits that are consistent with the relevant legislation, respond to TIA's priorities, and are aligned to TIA's objectives.

The function provides value-added assurance, supports positive change within TIA, and supports stewardship and accountability in the spending of public funds. Internal Audit focuses on the following key activities (amongst others):

- Risk areas are adequately identified and addressed.
- Breakdowns in key internal controls are identified and reported on and in response to these instances, appropriate improvements can be recommended and agreed with management for implementation.
- Non-compliance with TIA's corporate governance, policies and procedures, applicable regulations and statutory requirements are identified and implementation plans are put in place to redress and resolve these matters.

21.3 SUMMARY OF WORK DONE IN 2021/22

In accordance with the National Treasury requirements, an Annual Internal Audit Plan was prepared for 2021/22, which was approved by TIA's A&RC, as required. The plan was developed to enhance organisational value by providing risk-based and objective assurance, advice, and insight through professional practices to cope with emerging challenges.

During the period under review, an annual allocation of resources to audit activities was established on the basis of a systematic risk-based assessment, taking into account various financial, operational and strategic internal and external risks, policies, processes, and the requirements of the PFMA, Treasury Regulations, etc. In line with the approved Annual Internal Audit Plan, audits were conducted across various TIA functional areas. In addition, a certain amount of capacity was used for ad hoc projects, special investigations, whistleblowing matters, and requests from management, A&RC, and the Board.

From an overarching perspective, during the period under review, Internal Audit completed all the planned audit activities, which include internal assurance audits, project or programme audits, advisory assignments, and ad hoc requests. In this regard, no evidence was presented to suggest that there were material breakdowns in, or threats to, the internal control environment and the most significant risks at TIA are at acceptable levels. A year-on-year comparison in Internal Audit showed an improvement in the control environment, with TIA developing and implementing more stringent controls and with a significant decrease in the number of critical and major audit matters. All the recommendations provided by Internal Audit have been appreciated and adopted by TIA management, where applicable.

21.4 COMPLIANCE WITH LAWS AND REGULATIONS

TIA has implemented sufficient and adequate processes, procedures, policies, and frameworks to ensure that the Agency complies with legislative or regulatory matters that affect TIA. The Internal Audit planning process identifies audit areas in a manner that ensures compliance with legislative requirements and supports a value-added audit process. Non-compliance with applicable regulations and statutory requirements is identified and guidance is provided for implementation plans to redress and resolve these matters of non-compliance.

22. Fraud and Corruption

The provisions of section 38(1)(a)(i) of the PFMA stipulates that the Accounting Authority is responsible for ensuring that an organisation has and maintains an effective, efficient and transparent system of financial, risk management and internal controls. For this purpose, TIA has implemented a Fraud and Corruption Prevention Policy.

Fraud means the unlawful and intentional making of a misrepresentation which causes actual prejudice or which is potentially prejudicial to another, and includes offences in respect of corrupt activities as defined in the Prevention and Combating of Corrupt Activities Act 12 of 2004, and cybercrime as defined in the Electronic Communications and Transactions Act 25 of 2002.

Corruption is any conduct or behaviour where a person accepts, agrees or offers any gratification for himself or herself or for another person where the purpose is to act dishonestly or illegally. Such behaviour also includes the misuse of material or information, abuse of a position of authority or a breach of trust or violation of duty.

Procedure for disclosure

In terms of the amended Act, an employer is required to implement internal procedures for receiving and dealing with information about improprieties and must do so as follows:

- Any disclosure shall first be raised with the employee's line manager, verbally or in writing.
- Should the employee feel uncomfortable or if the line manager is party to the disclosed facts, the disclosure may then be raised with:
  * Executive: Corporate Services;
  * Any other Executive or Manager;
  * The Company Secretary;
  * The CEO; or
  * Head: Internal Audit.
- Should the above channels have been exhausted internally and the employee is of the opinion that the disclosure could not be trusted in the hands of the above employees for whatever reason, he/she may approach the Chairman of A&RC or make use of TIA's independent service provider for whistle-blowing, whose hotline number is communicated to all staff.
- Should an employee be uncomfortable approaching TIA staff or the Independent Service Provider he/she can call the National Anti-Corruption hotline.

Once a disclosure has been made, Management shall be obliged to:

- Acknowledge receipt of the disclosure in writing;
- Within a period of 21 days after receiving the protected disclosure, decide whether to investigate the matter or refer the disclosure to another person or body, if the disclosure could be investigated or dealt with more appropriately by that other person or body; and
- Inform the employee making a disclosure as to what steps had been taken once the disclosure has been made.

TIA shall ensure that any employee who makes a disclosure shall not be penalised or suffer any occupational detriment for doing so. Employees making a disclosure are not required to disclose their names.

23. Minimising Conflict of Interest

Annually, and on an ad hoc basis, through active solicitation, members are required to disclose potential conflicts of interest. During the period under review, disclosures received from members were closely scrutinised by the Company Secretary and the A&RC Chairman. No conflicts or potential conflicts of interests were noted. Where required, members were excused from matters which have given rise to conflicts of interests. Members are required to disclose any potential conflicts at every meeting.

24. Code of Conduct

To support good governance, TIA adopted a Code of Conduct as part of its policies and procedures. The code is adhered to in TIA's dealings with all stakeholders and organisations, internally, externally, nationally and globally. In addition, the Board incorporated a Code of Conduct into its Board Charter to deal with instances where Board members may have conflicts of interest. The Code of Conduct makes it clear that Board members may not have any dealings involving personal financial interests with TIA.

As indicated above, the Board operates and conducts itself through three standing sub-committees (A&RC, IFC and HR&REMCO), with a fourth committee (Board Technical Committee) that is not operational as yet. The Board's devolution of responsibilities, therefore, falls on these three sub-committees, which meet independently and report regularly to the full Board through their respective chairpersons.

25. Health, Safety and Environmental Issues

TIA is committed to prioritising the safety of its employees and visitors by ensuring safe and secure working environments. In this regard, strengthened health protocols were implemented to minimise the COVID-19 risk for TIA employees and visitors to the TIA Offices. Employee training and awareness sessions were also conducted.

TIA ensures compliance with occupational health and safety governance obligations by maintaining offices and providing the necessary equipment. The internal occupational health and safety measures implemented are aimed at protecting both employees and visitors. Regular inspections are conducted in the workplace to identify and minimise hazards that could possibly affect the safety of employees and visitors or expose them to health risks. Health and safety representatives have also been trained to respond to office environment emergencies.

Emergency evacuation exercises were conducted to ensure that all the employees are familiar with the emergency procedures and to test TIA's state of preparedness in case of emergencies. The fire equipment, backup generator and uninterrupted power supply systems have been tested regularly throughout the year to avoid operational disruptions and ensure business continuity.

26. Broad-Based Black Economic Empowerment

TIA continues with its commitment to supporting the country's transformational agenda and the policy objectives of B-BBEE. This is entrenched through contributions in various areas, including skills, enterprise and supplier development, and also preferential procurement. During the current year, the Agency's procurement strategy has focused on both black women-owned and black youth-owned businesses. Procurement from black women-owned businesses amounted to 27%, exceeding the annual target of 20% by 7%. Despite focussd procurement initiatives, procurement from black youth-owned businesses amounted to 7.4%,the which is 2.6% lower than the annual target of 10%. This was attributed to continuation of existing contracts and the specialised nature of procurement in some cases in which suppliers with youth ownership are limited. The Agency continues to follow focused procurement processes in order to promote and improve procurement from previously disadvantaged individuals.

TIA focuses not only on its own B-BBEE contribution, but also ensures that the principles of B-BBEE are entrenched in the businesses of its funded projects through continuous monitoring of project transformational plans. Targeted investment strategies that are enhanced further will be implemented in 2022/23 to facilitate transformation and inclusiveness in the NSI.

27. Company Secretary

The Company Secretary provides the Board with professional and independent guidance on corporate governance matters and its legal duties. In addition to coordinating the functioning of the Board and its committees, the Company Secretary acts as a central source of information and advice to the Board on matters of ethics, adherence to good corporate governance principles, compliance with procedures and applicable statutes and regulations.

In accordance with principle 10 of the King IV Report on Corporate Governance for SA, 2016 (King IV™ 2016), the Company Secretary reports functionally to the Board, and administratively to the CEO, as the designated member of the executive management for this purpose. The Company Secretary is not a Board member, and has unfettered access to the Board, but maintains an arm's-length relationship with the Board and its members. The appointment of the Company Secretary, Mr Louw, including his employment contract and remuneration, was approved by the Board.

The Company Secretary has certified that, to the best of his knowledge and belief, TIA has lodged all such returns as are required in terms of the Companies Act 71 of 2008, and that such returns are true, correct and up to date. In addition, he

has certified that TIA has lodged with the Minister of Higher Education, Science and Innovation the financial statements in respect of the preceding financial year.

28. Social Responsibility

In December 2021, TIA hosted an internal Charity Event that was aligned to the 13 days of Activism against Women and Child Abuse Campaign. TIA employees were requested to make individual donations which were collected by Human Resources and paid over to the Beth Shan (Salvation Army) and Mercy House safe houses for abused women. The two charities were identified via the Department of Social Development. A total of R2,700 was donated by TIA staff – R1,350 was paid to each of the two charities to buy essential items such as food and toiletries for the women in their care.

29. Audit and Risk Committee Report

The A&RC ("the committee") is appointed in terms of section 51 of the PFMA, read with principle 8 of King IV. The committee has performed its duties and carried out its responsibilities in accordance with its regularly reviewed Charter, and has executed specific duties delegated to it by the Board. Among other things, the Charter empowers the committee with the following responsibilities:

- Examine and review the AFS and report on the final results.
- Appoint and evaluate the qualification, appropriateness, eligibility and independence of the external auditor.
- Approve the internal audit plan, internal audit Charter and the fees of the external auditor.
- Evaluate the scope and effectiveness of the internal audit function to ensure that effective internal controls have been identified and are in place.
- Ensure TIA complies with legal and financial regulatory requirements.
- Evaluate the adequacy and efficiency of the internal control systems, accounting practices, information systems and auditing processes applied in the management of TIA.
- Discharge its duties relating to the safeguarding of assets, the implementation of adequate IT systems, effective control processes and the preparation of accurate financial reporting, and statements in compliance with all applicable legal requirements and accounting standards.
- Monitor financial and all other risks, ensuring that mitigating action plans are in place.

29.1 AUDIT COMMITTEE RESPONSIBILITY

The committee reports that it has complied with its responsibilities arising from section 51 (1)(a)(ii) of the PFMA and Treasury Regulation 27.1. The committee also reports that it has adopted appropriate formal terms of reference as its A&RC Charter has regulated its affairs in compliance with this charter and has discharged all its responsibilities as contained in the Charter, except that we have not reviewed changes in accounting policies and practices.

29.2 EFFECTIVENESS OF INTERNAL CONTROLS

Internal Audit is responsible for the evaluation of the effectiveness of TIA's internal controls, including recommending their improvement. Therefore, Internal Audit must determine whether the internal controls designed and applied by management are adequate and function as intended.

Our review of the findings of the Internal Audit work, which was based on the risk assessments conducted in the public entity, revealed certain weaknesses, which were then raised with the public entity.

Internal Audit work provided the following assurance to TIA management and the Board for the year under review:

- Assets are adequately and appropriately safeguarded.
- Funds disbursed by TIA are managed economically, effectively and efficiently.
- The applicable laws, regulations and directives are complied with.
- Resources are acquired economically, utilised efficiently and protected adequately.
- Significant financial, managerial and operating information is accurate, reliable and timely available.
- Internal controls and systems (including information technology systems) and corporate governance practices are efficient and effective.
- Acts, regulations, policies, procedures and contracts are complied with.
- Financial and operating information is effective.

Internal Audit provided recommendations for the improvement of the efficiency and effectiveness of operations. While several areas requiring improvement were identified, there is reasonable assurance that the most significant risks at TIA are at acceptable levels. It is Internal Audit's overall view that the control environment has improved since the previous financial year, based on a number of critical factors and metrics. All the outcomes from specific investigations undertaken by Internal Audit were adequately resolved during the year under review.

29.3 IN-YEAR MANAGEMENT AND MONTHLY/QUARTERLY REPORTING

In 2021/22, TIA reported quarterly to its executive authority as per the requirements contained in section 5.3.1 of the Treasury Regulations, read together with sections 27(4) and 40 of the PFMA. In the period under review, the A&RC ensured compliance with section 5.3.1 for the establishment of such procedures. In consideration of the reports during the year, the committee guided management in reviewing targets and assessing the adequacy of quarterly performance reports against the targets.

The public entity has reported monthly and quarterly to National Treasury, as is required by the PFMA.

29.4 EVALUATION OF FINANCIAL STATEMENTS

A&RC reviewed the AFS and agreed that the statements presented fairly, in all material respects, the consolidated financial position and performance of TIA. The committee concluded that it was satisfied that the statements complied with GRAP.

29.5 EXTERNAL AUDITOR

The external auditors, Rakoma & Associates Inc., remain on record, with oversight by the office of the Auditor-General of SA. A&RC was satisfied that the external auditors have complied with sections 90(2)(b) and 94(8) of the Companies Act (2008), as amended, and confirmed that there are no conflicts of interest as determined by the criteria prescribed by the Independent Regulatory Board for Auditors. A&RC, in consultation with management, agreed to the terms contained in the engagement letter, audit plan and audit fees for the financial year ended 31 March 2022. In consideration of the external audit plan, the committee was satisfied that it is comprehensive and adequately interrogates the risk areas identified. The external auditors remain independent and no non-audit services were provided. In further consideration of their services and engagement with the external auditors, A&RC was satisfied that:

- the quality and effectiveness of their services were appropriate;
- in-committee sessions excluding management were held when required; and
- a level of assurance was provided to confirm that Rakoma & Associates Inc. maintained its integrity as a firm through open and transparent processes, and accordingly posed no risk to TIA during the execution of its duties.

No reportable irregularities were identified by the external auditors.

29.6 AUDITOR'S REPORT

We have reviewed the entity's implementation plan for the audit issues raised in the previous year and we are satisfied that the matters have been adequately resolved.

The Audit Committee concurs with and accepts the conclusions of the Auditor-General on the AFS and is of the opinion that the audited AFS should be accepted and read together with the report of the Auditor-General.

29.7 GOING CONCERN

Management provided the assurance that TIA is a going concern. Through its annual funding allocation received from its executive authority, income from royalties and interest received, there appeared to be no indicators to suggest that TIA will not continue as a going concern for the next 12 months.

29.8 FRAUD PREVENTION

A&RC assists the Board in discharging its duties regarding the identification, responsiveness and mitigation strategies in relation to fraud prevention. In this regard, A&RC has ensured that fraud prevention policies and procedures are in place, along with an anonymous ethics line to manage matters relating to fraud; and A&RC regularly evaluates the effectiveness of these processes.

29.9 RISK MANAGEMENT

Risk management remains central to TIA's business. Key strategic risks were identified and deliberated on by management and the Board. Risks were evaluated according to impact and likelihood. Appropriate actions and action plans have been considered and implemented, where required, to mitigate risks. Management is aware of the need to improve risk management regarding the following:

- Embedding risk management in the organisational processes.
- Embedding risk management in projects.

Management regularly reviews risk-related internal control processes and will continue to do so through the Risk Management Committee. Actions are delegated to staff together with encouragement to embed risk management in the execution of their daily tasks.

TIA's enterprise-wide risk management activities and initiatives were consistently aligned to best international practices (ISO 31000 – 2018 International Standards, COSO: Enterprise Risk Management – Integrated Framework (September 2017), the King IV Report on Corporate Governance, the Public Sector Risk Management Framework and the Institute of Risk Management SA risk principles). Accordingly, A&RC can report that the risk management processes for the period under review were adequate.

29.10 INFORMATION TECHNOLOGY GOVERNANCE

A&RC is responsible for monitoring information technology governance. The approved information technology policies that are in place and the procedures that have been implemented safeguard TIA's information technology systems and information and draw on the Agency's disaster recovery plans when necessary. No material weaknesses were found in TIA's information technology environment during the period under review.

29.11 GOVERNANCE ON QUALITY

The Board was pleased to learn of management's having secured the recertification of TIA's ISO 9001: 2015 standard following a surveillance audit for the year under review. This standard is used to demonstrate the Agency's ability to consistently provide products and services that meet customer and regulatory requirements.

Mr Thabiso Ramasike
Audit and Risk Committee Chairperson

PART D

Human Resource Management

30. Introduction

TIA's Human Resources unit adds value to TIA by ensuring that each sub-programme is adequately resourced and capacitated to deliver on the strategy. Human Resources implements and maintains the talent management strategy, focusing on each element of the human resources value chain (Figure 30).

Figure 30 : TIA's Human resources value chain

As a result of tough economic conditions and a limited human resources budget, TIA experienced a high staff turnover during the past two years. TIA responded to this risk, through the development of an Employee Value Proposition (Figure 31), considering monetary rewards but, more importantly, non-monetary rewards of value to its employees.

Benefits
- Retirement benefits
- Risk benefits
- Employee wellness
- Time off
- Leave
- Education
- Flexibility

Career
- Ability and opportunity to progress and develop
- Stability
- Training and education at work
- Evaluation and feedback
- Career development

Compensation
- Market-related salaries
- Annual salary increases
- Performance-based increases
- Harmonisation
- Bonuses
- Acting allowances

Culture
- Understanding the organisation's goals and plans
- Team development
- Leaders and managers
- Support
- Collaboration and team spirit
- Social responsibility
- Trust
- Opportunity to make a difference to society, the economy and the environment through innovation

Work environment
- Safe and secure office environment
- Remote working conditions
- Recognition
- Personal achievements
- Work–life balance
- Understanding one's role and responsibility
- Employee engagement surveys

Figure 31: TIA's Employee Value Proposition

31. Human Resources Oversight Statistics

31.1 PERSONNEL COST BY DIVISION

The TIA organogram comprises three core divisions, namely, Bio-economy, Commercialisation and Innovation Enabling. The support functions under the Office of the CEO, Finance and Corporate Services are reported under Administration.

TIA implemented measures to reduce operational costs, resulting in an increase of only 7.5%. Personnel expenditure increased by 5.0% during the financial year. This resulted in a decrease in the personnel expenditure as a percentage of total expenditure from 17.8% to 17.4%.

The average personnel cost per employee increased from approximately R697,000 to R752,000 during the past financial year. This resulted mainly from the fact that a number of positions were filled for only a portion of the previous financial year and the number of interns funded from the MTEF allocation reduced from 18 to nine. Personnel costs by division are shown in Table 18.

Table 18: Personnel costs by division for 2021/22

Division	Total Expenditure for the Entity (R'000)	Personnel Expenditure (R'000)	Personnel Expenditure as a % of Total Expenditure	Number of Employees	Average Personnel Cost per Employee (R'000)
Administration*	84,821	52,107	61.4	72	724
Bio-Economy	250,483	19,881	7.9	27	736
Innovation Enabling	172,660	16,462	9.5	23	716
Commercialisation	103,242	15,976	15.5	19	841
Other**	–	1,662	–	N/A	N/A
TOTAL	**611,206**	**106,088**	**17.4*** **	**141**	**752*** **

** Administration incorporates Corporate Services, the CEO's Office and the CFO's Office.*
*** Other costs include Board remuneration, interns, workman's compensation and other provisions.*
**** This is the average for TIA, not the sum of the above averages.*
The table includes only positions funded through the MTEF allocation.

31.2 PERSONNEL COST BY SALARY BAND

The notable movement in the average cost per employee per occupational level occurred at the top management level (75% increase). Three new executives were appointed for a portion of the previous financial year and remuneration for these employees was not reflected for the full year during 2020/21.

This resulted in the increase in the average personnel cost per employee from approximately R1,284,100 to R2,253,000 per employee for the top management level in 2021/22. Personnel costs by salary band are shown in Table 19.

Table 19: Personnel cost by salary band for 2021/22

Level	Personnel Expenditure (R'000)	% of Personnel Expenditure To Total Personnel Cost	Number of Employees	Average Personnel Cost per Employee (R'000)
Top management	11,265	10.6	5	2,253
Senior management	25,973	24.5	21	1,237
Professional qualified	48,974	46.2	65	753
Skilled	16,709	15.8	41	408
Semi-skilled	854	0.8	4	214
Unskilled	651	0.6	5	130
Other*	1,662	1.6	N/A	N/A
TOTAL	**106,088**	**100**	**141**	**752****

31.3 PERFORMANCE REWARDS

Aligned to the Remuneration and Rewards Policy, performance-based incentives are paid only to those employees who meet certain performance criteria. The incentive is determined based on the performance of the employee and translates into a percentage of the employee's total cost to company.

Bonuses were funded from savings realised during 2020/21 and were paid to employees after consultation with National Treasury and the Board to retain high-performing staff. Bonuses were paid in 2021/22 to staff members who performed well in 2020/21 as per Table 20.

Table 20: Performance rewards for 2021/22

Level	Performance Rewards (R'000)	Personnel Expenditure (R'000)	% of Performance Rewards to Total Personnel Cost
Top management	693	11,265	6.2
Senior management	1,663	25,973	6.4
Professional qualified	3,044	48,974	6.2
Skilled	1,033	16,709	6.2
Semi-skilled	41	854	4.8
Unskilled	50	651	7.7
Other*	N/A	1,662	N/A
TOTAL	**6,524**	**106,088**	**6.1****

** Other costs include Board remuneration, interns, workmen's compensation and other provisions.*
*** This is the average for TIA, not the sum of the above averages.*
The table includes only positions funded through the MTEF allocation.

31.4 TRAINING COSTS

Training initiatives during the year included Executive Mentoring and Coaching, Customer Centricity, Commercialisation, IP Management, and the Protection of Personal Information Act training. In addition, employees were also supported to attend training included on their Personal Development Plans. TIA supported nine employees towards obtaining formal qualifications through studies. Training costs are shown in Table 21.

Table 21: Training costs for 2021/22

Programme	Personnel Expenditure (R'000)	Training Expenditure (R'000)	Training Expenditure as a % of Personnel Cost	Number of Employees Trained	Average Training Cost per Employee (R'000)
Administration*	52,107	973	1.9	74	13
Bio-Economy	19,881	614	3.1	49	13
Innovation Enabling	16,462	254	1.5	7	36
Commercialisation	15,976	293	1.8	23	13
Other**	1,662	N/A	N/A	0	N/A
TOTAL	**106,088**	**2,134**	**2.0**	**153*****	**14******

** Administration incorporates Corporate Services, the CEO's Office and the CFO's Office.*
*** Other costs include Board remuneration, interns, workman's compensation and other provisions.*
**** Training for positions funded through Investments (ringfenced) are also included.*
***** This is the average for TIA, not the sum of the above averages.*

31.5 EMPLOYMENT AND VACANCIES

As a result of the prevailing economic conditions and the resultant strain on financial resources, TIA prioritised those vacancies it planned to fill during 2021/22. In this regard, only 19 of the 44 vacancies have been funded for recruitment in the financial year. As at 31 March 2022, 92% of TIA's funded positions were filled. The average vacancy rate over the year reduced slightly from 23.0% as at 31 March 2021 to 22.5% as at 31 March 2022. In addition, TIA also made use of secondment contracts and appointing staff in an acting capacity to ensure that key areas of delivery are appropriately capacitated. Employment and vacancies by division and by salary band are shown in Table 22 and in Table 23 respectively.

Table 22: Employment and vacancies by division for 2021/22

Programme	2020/21 Number of Employees	2021/22 Approved Posts	2021/22 Number of Employees	2021/22 Vacancies	% of Vacancies
Administration*	67	78	66	12	15.4
Bio-Economy	33	50	37	13	26.0
Innovation Enabling	27	38	25	13	34.2
Commercialisation	18	24	17	7	29.2
TOTAL	**145**	**190**	**145**	**45**	**23.7****

** Administration incorporates Corporate Services, the CEO's Office and the CFO's Office.*
*** This is the average for TIA, not the sum of the above averages.*
Note: The table excludes interns, but includes ringfenced positions.

Two positions on the Top Management Level were vacant as at 31 March 2022. The position of CEO is on hold pending a review of TIA. Recruitment for the position of Executive: Innovation Enabling was finalised during October 2021.

Table 23: Employment and vacancies by division for 2021/22

Level	2020/21 Number of Employees	2021/22 Approved Posts	2021/22 Number of Employees	2021/22 Vacancies	% of Vacancies
Top management	5	7	5	2	28,6
Senior management	20	26	20	6	23.1
Professional qualified	64	91	66	25	27.5
Skilled	46	57	46	11	19.3
Semi-skilled	4	4	3	1	25.0
Unskilled	6	5	5	–	–
TOTAL	**145**	**190**	**145**	**45**	**23.7***

** This is the average for TIA, not the sum of the above averages.*
Note: The table excludes interns, but includes ringfenced positions.

31.6 EMPLOYMENT CHANGES

TIA experienced a high staff turnover during 2021/22 and recruitment for less critical positions was placed on hold pending the TIA Ministerial Review outcomes. TIA's staff turnover rate for the period under review was 10.11%, with further employment changes by salary band shown in Table 24. This includes internal recruitment and promotions.

Table 24: Personnel cost by salary band for 2021/22

Level	Employment as at 1 April 2021	Appointments	Terminations	Employment as at 31 March 2022
Top management	4	1	-	5
Senior management	19	3	2	20
Professional qualified	66	10	10	66
Skilled	47	4	5	46
Semi-skilled	3	0	-	3
Unskilled	6	0	1	5
TOTAL	**145**	**18**	**18**	**145**

Note: The table excludes interns, changes in opening and closing balances due to internal promotions and movements.

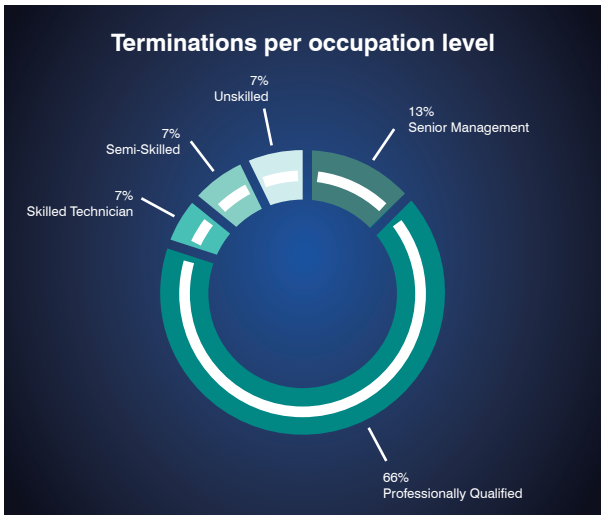


Figure 32: Terminations per occupational level

Table 25: Reasons for staff leaving in 2021/22

Reason	Number	% of Total Number of Staff Leaving
Death	2	13.3
Resignation	13	86.7
Dismissal	0	0
Retirement	0	0
Ill health	0	0
Expiry of contract	0	0
Other	0	0
Total	**15**	**100**

Note: The table excludes interns.

31.7 REASONS FOR STAFF LEAVING

It is very unfortunate that two of TIA's staff members lost their lives during the financial year. In addition, other high-performing staff (especially at the Professionally Qualified level) left TIA in pursuit of better career opportunities. The reasons for staff leaving are shown in Table 25 and the reasons for staff resignations are indicated in Table 26.

Table 26: Reasons for staff resignations in 2021/22

Reason	Number	% of Total Number of Staff Leaving
More attractive salary offer	6	46.2
Own business	1	7.7
Career growth opportunity	3	23.1
Reason not disclosed	1	7.7
Personal reasons	1	7.7
Improved work-life balance	1	7.7
Total	**13**	**100.1***

** Does not add up to 100% due to rounding.*
Note: The table excludes interns.

31.8 LABOUR RELATIONS: MISCONDUCT AND DISCIPLINARY ACTION

Table 27: Misconduct and disciplinary action in 2021/22

Nature of disciplinary action	Number
Verbal warning	1
Written warning	0
Final written warning	0
Dismissal	0

31.9 EQUITY TARGET, EMPLOYMENT EQUITY STATUS AND TRANSFORMATION

TIA is committed to transformation, and the recruitment of women, youth and people with disabilities is fundamental to this national priority. To align with the EAP, recruitment practices in 2021/22 focused on the recruitment of African males and Coloured males.

TIA's employment equity profile as at 31 March 2022 is shown in Figure 36. The graphic depicts the actual number of employees (according to demographic category) currently employed by TIA compared to the ideal based on the EAP.

TIA's staff complement as at 31 March 2022 fairly represents most of the demographic categories as per the EAP, apart from African males and Coloured males. Recruitment initiatives were therefore focused on attracting African male and Coloured male employees. For the year until 31 March 2022, eight positions were filled by African males and one position was filled by a Coloured male. The percentage of African males increased from 25.0% as at 31 March 2021 to 27.6% as at 31 March 2022. During the same period, the proportion of Coloured males increased from 2.1% to 2.8%.

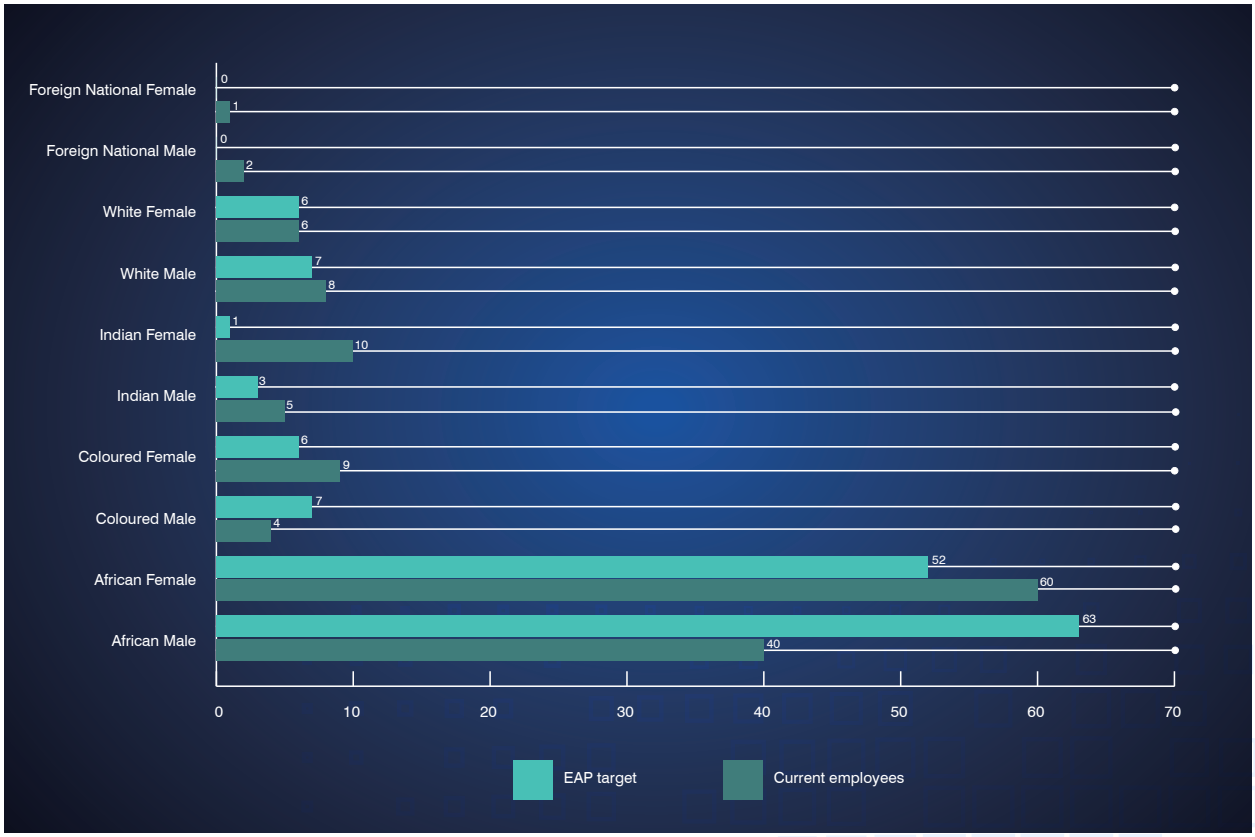


Figure 33: TIA's employment equity profile (measured against the EAP) as at 31 March 2021

TIA is committed to transformation and the recruitment of women, youth and people with disabilities is foundational to achieving this national priority. As of 31 March 2022, 60.0% of TIA's staff were female employees, 24.1% are classified as youth (between the age of 20 and 35) and 2.8% were employees with disabilities (against a target of 3.0%). TIA also created learnership opportunities for 32 interns, all between the age of 20 and 35. The employment equity demographics and occupational levels in each of these categories are presented in Figure 34, Table 28, Table 29, and Table 30.

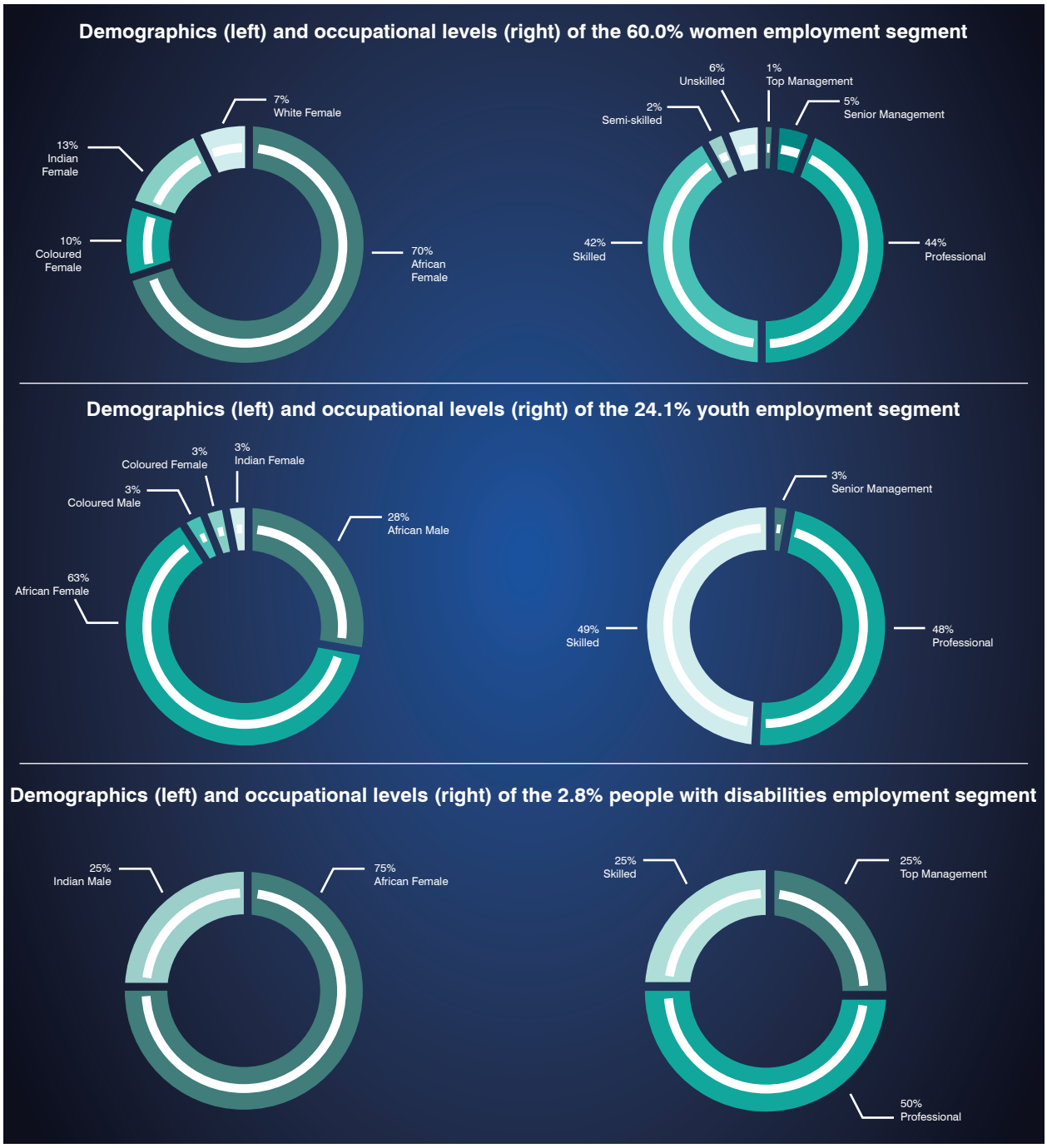


Figure 34: Employment equity demographics and occupational levels of women, youth and people with disabilities in the respective employment segments for 2021/22

Table 28: Female employees at TIA for 2021/22 as at 31 March 2022

Level	AFRICAN		COLOURED		INDIAN		WHITE	
	Current	Target	Current	Target	Current	Target	Current	Target
Top management	0	1	0	0	0	0	1	0
Senior management	2	2	0	0	1	0	1	0
Professional qualified	23	1	3	1	7	1	4	0
Skilled	29	0	5	0	2	0	0	0
Semi-skilled	1	0	1	0	0	0	0	0
Unskilled	5	0	0	0	0	0	0	0
TOTAL	**60**	**4**	**9**	**1**	**10**	**1**	**6**	**0**

Note: This table excludes interns.

Table 29: Male employees at TIA for 2021/22 as at 31 March 2022

Level	AFRICAN		COLOURED		INDIAN		WHITE	
	Current	Target	Current	Target	Current	Target	Current	Target
Top management	3	0	0	0	1	0	0	0
Senior management	8	0	1	0	2	0	3	0
Professional qualified	19	4	3	1	2	0	5	0
Skilled	9	3	0	0	0	0	0	0
Semi-skilled	1	0	0	0	0	0	0	0
Unskilled	0	0	0	0	0	0	0	0
TOTAL	**40**	**7**	**4**	**1**	**5**	**0**	**8**	**0**

Note: This table excludes interns.

Table 30: People with disabilities employed at TIA for 2021/22 as at 31 March 2022

Level	FEMALE		MALE	
	Current	Target	Current	Target
Top management	0	0	1	0
Senior management	0	0	0	0
Professional qualified	2	0	0	0
Skilled	1	0	0	0
Semi-skilled	0	0	0	0
Unskilled	0	0	0	0
TOTAL	**3**	**0**	**1**	**0**

Note: This table excludes interns.

PART E

Financial Information

32. BOARD'S RESPONSIBILITIES AND APPROVAL

The Board is required by the Public Finance Management Act (Act 1 of 1999), to maintain adequate accounting records and are responsible for the content and integrity of the consolidated annual financial statements and related financial information included in this report. It is the responsibility of the Board to ensure that the consolidated annual financial statements fairly present the state of affairs of the Agency as at the end of the financial year and the results of its operations and cash flows for the period then ended. The external auditors are engaged to express an independent opinion on the consolidated annual financial statements and were given unrestricted access to all financial records and related data.

The consolidated annual financial statements have been prepared in accordance with Standards of Generally Recognised Accounting Practice (GRAP) including any interpretations, guidelines and directives issued by the Accounting Standards Board.

The consolidated annual financial statements are based upon appropriate accounting policies consistently applied and supported by reasonable and prudent judgements and estimates.

The Board acknowledge that they are ultimately responsible for the system of internal financial control established by the economic entity and place considerable importance on maintaining a strong control environment. To enable the Board to meet these responsibilities, the Board sets standards for internal control aimed at reducing the risk of error in a cost effective manner. The standards include the proper delegation of responsibilities within a clearly defined framework, effective accounting procedures and adequate segregation of duties to ensure an acceptable level of risk. These controls are monitored throughout the economic entity and all employees are required to maintain the highest ethical standards in ensuring the economic entity's business is conducted in a manner that in all reasonable circumstances is above reproach. The focus of risk management in the economic entity is on identifying, assessing, managing and monitoring all known forms of risk across the economic entity. While operating risk cannot be fully eliminated, the economic entity endeavours to minimise it by ensuring that appropriate infrastructure, controls, systems and ethical behaviour are applied and managed within predetermined procedures and constraints.

The Board is of the opinion, based on the information and explanations given by management, that the system of internal control provides reasonable assurance that the financial records may be relied on for the preparation of the consolidated annual financial statements. However, any system of internal financial control can provide only reasonable, and not absolute, assurance against material misstatement.

The Board has reviewed the economic entity's cash flow forecast for the year to 31 March 2022 and, in light of this review and the current financial position, they are satisfied that the economic entity has access to adequate resources to continue in operational existence for the foreseeable future.

The external auditors are responsible for independently reviewing and reporting on the economic entity's consolidated annual financial statements. The consolidated annual financial statements have been examined by the economic entity's external auditors and their report is presented on pages 114-116. The consolidated annual financial statements set out on pages 117-150, which have been prepared on the going concern basis, were approved by the Board on 29 July 2022 and were signed on its behalf by:

Matsi Modise
Ms M Modise
Chairperson

Mr P Krappie
Acting Chief Executive Officer

33. INDEPENDENT AUDITOR'S REPORT TO PARLIAMENT ON TECHNOLOGY INNOVATION AGENCY

REPORT ON THE AUDIT OF THE CONSOLIDATED AND SEPARATE FINANCIAL STATEMENTS

OPINION

1. We have audited the consolidated and separate financial statements of the Technology Innovation Agency and its subsidiaries (the group) set out on pages 117-150 which comprise the consolidated and separate statement of financial position as at 31 March 2022, the consolidated and separate statement of financial performance, statement of changes in net asset, cash flow statement and statement of comparison of budget and actual amounts for the year then ended, as well as notes to the consolidated and separate financial statements, including a summary of significant accounting policies.

2. In our opinion, the consolidated and separate financial statements present fairly, in all material respects, the financial position of the group as at 31 March 2022, and their financial performance and cash flows for the year then ended in accordance with South African Standards of Generally Recognised Accounting Practices (GRAP) and the requirements of the Public Finance Management Act of South Africa 1999 (Act No.1 of 1999) PFMA.

BASIS FOR OPINION

3. We conducted our audit in accordance with the International Standards on Auditing (ISAs). Our responsibilities under those standards are further described in the auditor's responsibilities for the audit of the consolidated and separate financial statements section of our report.

4. We are independent of the group in accordance with Independent Regulatory Board for *Auditors' Code of Professional Conduct for Auditors* (IRBA Code) and other independence requirements applicable to performing audits of financial statements in South Africa. We have fulfilled our other ethical responsibilities in accordance with the IRBA Code and in accordance with other ethical requirements applicable to performing audits in South Africa. The IRBA Code is consistent with the corresponding sections of the International Ethics Standards Board for Accountants' *International Code of Ethics for Professional Accountants (Including International Independence Standards)*.

5. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

RESPONSIBILITIES OF THE ACCOUNTING AUTHORITY FOR THE FINANCIAL STATEMENTS

6. The board of directors, which constitutes the accounting authority, is responsible for the preparation and fair presentation of the consolidated and separate financial statements in accordance with GRAP and the requirements of the PFMA, and for such internal control as the accounting authority determines is necessary to enable the preparation of consolidated and separate financial statements that are free from material misstatement, whether due to fraud or error.

7. In preparing the consolidated and separate financial statements, the accounting authority is responsible for assessing the group's ability to continue as a going concern, disclosing, as applicable, matters relating to going concern and using the going concern basis of accounting unless the accounting authority either intends to liquidate the group or to cease operations, or has no realistic alternative but to do so.

AUDITOR'S RESPONSIBILITIES FOR THE AUDIT OF THE CONSOLIDATED AND SEPARATE FINANCIAL STATEMENTS

8. Our objectives are to obtain reasonable assurance about whether the consolidated and separate financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the ISAs will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated and separate financial statements.

9. A further description of our responsibilities for the audit of the consolidated and separate financial statements is included in the annexure to this auditor's report.

REPORT ON THE AUDIT OF THE ANNUAL PERFORMANCE REPORT

INTRODUCTION AND SCOPE

10. In accordance with the Public Audit Act 25 of 2004 (PAA) and the general notice issued in terms thereof, we have a responsibility to report on the usefulness and reliability of the reported performance information against predetermined objectives for selected programmes presented in the annual performance report. We performed procedures to identify material findings but not to gather evidence to express assurance.

11. Our procedures address the usefulness and reliability of the reported performance information, which must be based on the public entity's approved performance planning documents. We have not evaluated the completeness and appropriateness of the performance indicators included in the planning documents. Our procedures do not examine whether the actions taken by the public entity enabled service delivery. Our procedures do not extend to any disclosures or assertions relating to the extent of achievements in the current year or planned performance strategies and information in respect of future periods that may be included as part of the reported performance information. Accordingly, our findings do not extend to these matters.

12. We evaluated the usefulness and reliability of the reported performance information in accordance with the criteria developed from the performance management and reporting framework, as defined in the general notice, for the following selected programme presented in the public entity's annual performance report for the year ended 31 March 2022:

Programme	Pages in the annual performance report
Programme 2: Outcome 1 – commercialised innovations	26

13. We performed procedures to determine whether the reported performance information was properly presented and whether performance was consistent with the approved performance planning documents. We performed further procedures to determine whether the indicators and related targets were measurable and relevant, and assessed the reliability of the reported performance information to determine whether it was valid, accurate and complete.

14. We did not identify any material findings on the usefulness and reliability of the reported performance information for this programme:
    - Programme 2: Outcome 1 – commercialised innovations

OTHER MATTER

15. We draw attention to the matter below.

ACHIEVEMENT OF PLANNED TARGETS

16. Refer to the annual performance report on pages 26-30 for information on the achievement of planned targets for the year and management's explanations provided for the under/ over achievement of targets.

REPORT ON THE AUDIT OF COMPLIANCE WITH LEGISLATION

INTRODUCTION AND SCOPE

17. In accordance with the PAA and the general notice issued in terms thereof, we have a responsibility to report material findings on the public entity's compliance with specific matters in key legislation. We performed procedures to identify findings but not to gather evidence to express assurance.

18. We did not identify any material findings on compliance with the specific matters in key legislation set out in the general notice issued in terms of the PAA.

OTHER INFORMATION

19. The accounting authority is responsible for the other information. The other information comprises the information included in the annual report. The other information does not include the consolidated and separate financial statements, the auditor's report and the selected programme presented in the annual performance report that has been specifically reported in this auditor's report.

20. Our opinion on the financial statements and my findings on the reported performance information and compliance with legislation do not cover the other information and we do not express an audit opinion or any form of assurance conclusion on it.

21. In connection with our audit, our responsibility is to read the other information and, in doing so, consider whether the other information is materially inconsistent with the consolidated and separate financial statements and the selected programme presented in the annual performance report, or our knowledge obtained in the audit, or otherwise appears to be materially misstated.

22. We have nothing to report in this regard.

INTERNAL CONTROL DEFICIENCIES

23. We considered internal control relevant to our audit of the consolidated and separate financial statements, reported performance information and compliance with applicable legislation; however, our objective was not to express any form of assurance on it. We did not identify any significant deficiencies in internal control.

OTHER REPORTS

24. We draw attention to the following engagements conducted by various parties which had, or could have, an impact on the matters reported in the public entity's financial statements, reported performance information, compliance with applicable legislation and other related matters. These reports did not form part of our opinion on the financial statements or our findings on the reported performance information or compliance with legislation.

AUDIT-RELATED SERVICES AND SPECIAL AUDITS

25. We will perform procedures to review the Treasury Pack to ensure conversion adjustments are captured correctly for the consolidation purposes by National Treasury

AUDITOR TENURE

26. In terms of the IRBA rule published in Government gazette number 39475 dated 4 December 2015, we report that Rakoma and Associates Incorporated has been the auditor of Technology Innovation Agency for 4 years.

Rakoma and Associates Inc
Rakoma and Associates Incorporated
Per: Patience Moyo CA (SA)
Partner
Registered Auditor

29 July 2022

Willow Wood Office Park Block D
Corner 3rd Ave & Cedar Rd
Johannesburg
2021

ANNEXURE – AUDITOR'S RESPONSIBILITY FOR THE AUDIT

1. As part of an audit in accordance with the ISAs, we exercise professional judgement and maintain professional scepticism throughout our audit of the consolidated and separate financial statements, and the procedures performed on the reported performance information for the selected programme and on the public entity's compliance with respect to the selected subject matters.

FINANCIAL STATEMENTS

2. In addition to our responsibility for the audit of the consolidated and separate financial statements as described in this auditor's report, we also:

    - identify and assess the risks of material misstatement of the consolidated and separate financial statements whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control
    - obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the public entity's internal control
    - evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the board of directors, which constitutes the accounting authority
    - conclude on the appropriateness of the accounting authority's use of the going concern basis of accounting in the preparation of the financial statements. We also conclude, based on the audit evidence obtained, whether a material uncertainty exists relating to events or conditions that may cast significant doubt on the ability of the Technology Innovation Agency and its subsidiaries and its subsidiaries to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements about the material uncertainty or, if such disclosures are inadequate, to modify our opinion on the financial statements. Our conclusions are based on the information available to us at the date of this auditor's report. However, future events or conditions may cause a public entity to cease operating as a going concern
    - evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and determine whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation; and

    - obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our audit opinion.

COMMUNICATION WITH THOSE CHARGED WITH GOVERNANCE

3. We communicate with the accounting authority regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

34. ANNUAL FINANCIAL STATEMENTS GENERAL INFORMATION

Country of incorporation and domicile	South Africa
Nature of business and principal activities	To support and enable technology innovation across all sectors of the economy in order to achieve socio-economic benefits for South Africa.
Directors	Ms M Modise (Chairperson from 01/11/2021) BA Mboniswa (Interim Chairperson from 13/06/2020 until 31/10/2021 re-appointed as board member with effect from 01/11/2021) Mr TG Ramasike (re-appointed with effect from 01/11/2021) Ms JSP Matsebula (re-appointed with effect from 01/11/2021) Ms A Canca (appointed with effect from 01/11/2021) Dr R Iyer (appointed with effect from 01/11/2021) Ms L Matlali (appointed with effect from 01/11/2021) Mr P Krappie - Acting Chief Executive Officer (ex-officio from 13/06/2020)
Business address	83 Lois Avenue Menlyn Pretoria 0181
Postal address	PO Box 172 Pretoria 0063
Bankers	Standard Bank Ltd
Auditors	Rakoma Associates Incorporated (Appointed in terms of the Public Audit Act as approved by the Auditor General of South Africa)
Secretary	Mr K Louw
Preparer	The consolidated annual financial statements were internally compiled by: Mr I Abdoola Chief Financial Officer

STATEMENT OF FINANCIAL POSITION
as at 31 March 2022

		(R thousands)			
		Economic entity		Controlling entity	
	Note(s)	March 2022	March 2021	March 2022	March 2021
Assets					
Current Assets					
Loans and receivables	7	5,975	9,195	5,975	9,195
Trade and other receivables	9	4,519	1,035	4,519	1,035
Prepayments	10	3,331	3,503	3,331	3,503
Cash and cash equivalents	11	436,230	241,970	436,230	241,970
		450,055	**255,703**	**450,055**	**255,703**
Non-Current Assets					
Property, plant and equipment	3	5,116	6,750	5,116	6,750
Intangible assets	4	738	1,799	738	1,799
Investments in controlled entities	5	–	–	–	2,189
Investments in associates	6	234	296	–	–
Loans and receivables	7	23,925	25,410	23,925	25,410
Other financial assets	8	3,000	3,000	3,000	3,000
		33,013	**37,255**	**32,779**	**39,148**
Total Assets		**483,068**	**292,958**	**482,834**	**294,851**
Liabilities					
Current Liabilitie					
Committed conditional grants	13	274,168	126,669	274,168	126,669
Finance lease obligation	12	63	174	63	174
Operating lease liability		248	430	248	430
Trade and other payables	14	49,185	65,013	49,182	67,199
		323,664	**192,286**	**323,661**	**194,472**
Non-Current Liabilities					
Committed conditional grants	13	56,672	20,533	56,672	20,533
Total Liabilities		**380,336**	**212,819**	**380,333**	**215,005**
Net Assets		**102,732**	**80,139**	**102,501**	**79,846**

STATEMENT OF FINANCIAL PERFORMANCE
for the year ended 31 March 2022

		(R thousands)			
		Economic entity		Controlling entity	
	Note(s)	March 2022	March 2021	March 2022	March 2021
Revenue					
Revenue	15	619,340	569,715	619,340	569,715
Other income	16	6,119	5,483	6,119	5,483
Interest received	17	8,227	7,443	8,227	7,443
Gain on disposal of investments		175	–	175	–
Total revenue		**633,861**	**582,641**	**633,861**	**582,641**
Expenditure					
Employee related costs	18	(107,945)	(101,053)	(107,945)	(101,053)
Project funding expenditure	19	(458,856)	(419,247)	(458,856)	(419,247)
Depreciation and amortisation		(3,563)	(4,516)	(3,563)	(4,516)
Lease rentals on operating lease		(10,690)	(10,924)	(10,690)	(10,924)
Impairment	20	(2,251)	(8,847)	(2,251)	(8,847)
Deficit from equity accounted investments	6	(62)	(259)	–	–
Other operating expenses	21	(27,901)	(23,827)	(27,901)	(23,827)
Total expenditure		**(611,268)**	**(568,673)**	**(611,206)**	**(568,414)**
Surplus/(Deficit) for the year		**22,593**	**13,968**	**22,655**	**14,227**
Attributable to:					
Owners of the controlling entity		22,593	13,968	22,655	14,227
Non-controlling interest		–	–	–	–
		22,593	**13,968**	**22,655**	**14,227**

STATEMENT OF CHANGES IN NET ASSETS
for the year ended 31 March 2022

	(R thousands)		
	Accumulated surplus	Non-controlling interest	Total net assets
Economic entity			
Balance at 01 April 2020	**66,171**	**–**	**66,171**
Changes in net assets:			
Surplus for the year	13,968	–	13,968
Total changes	13,968	–	13,968
Balance at 01 April 2021	**80,139**	**–**	**80,139**
Changes in net assets:			
Surplus for the year	22,593	–	22,593
Total changes	22,593	–	22,593
Balance at 31 March 2022	**102,732**	**–**	**102,732**
Controlling entity			
Balance at 01 April 2020	**65,619**	**–**	**65,619**
Changes in net assets:			
Surplus for the year	14,227	–	14,227
Total changes	14,227	–	14,227
Balance at 01 April 2021	**79,846**	**–**	**79,846**
Changes in net assets:			
Surplus for the year	22,655	–	22,655
Total changes	22,655	–	22,655
Balance at 31 March 2022	**102,501**	**–**	**102,501**

CASH FLOW STATEMENT
for the year ended 31 March 2022

		(R thousands)			
		Economic entity		Controlling entity	
	Note(s)	March 2022	March 2021	March 2022	March 2021
Cash flows from operating activities					
Receipts					
Grants		619,340	569,715	619,340	569,715
Interest income		8,035	6,451	8,035	6,451
Other receipts		2,607	1,411	2,607	1,411
		629,982	577,577	629,982	577,577
Payments					
Employee related costs		(107,731)	(101,053)	(107,731)	(101,053)
Project funding expenditure		(449,801)	(408,153)	(449,801)	(408,153)
Other payments		(65,551)	(32,394)	(65,551)	(29,803)
		(623,083)	(541,600)	(623,083)	(539,009)
Net cash flows from operating activities	23	**6,899**	**35,977**	**6,899**	**38,568**
Cash flows from investing activities					
Purchase of property, plant and equipment	3	(1,355)	(1,319)	(1,355)	(1,319)
Purchase of intangible assets	4	–	(192)	–	(192)
Repayment of loans from economic entities		5,312	1,118	5,312	1,118
Proceeds from sales of assets		65	–	65	–
Payment to minorities following deregistration of the investment		(299)	–	(299)	–
Net cash flows from investing activities		**3,723**	**(393)**	**3,723**	**(393)**
Cash flows from financing activities					
Conditional grants received		351,908	219,746	351,908	219,746
Conditional grants paid		(168,270)	(160,900)	168,270	(160,900)
Net cash flows from financing activities		**183,638**	**58,846**	**183,638**	**58,846**
Net increase/(decrease) in cash and cash equivalents		**194,260**	**94,430**	**194,260**	**97,021**
Cash and cash equivalents at the beginning of the year		241,970	147,540	241,970	144,949
Cash and cash equivalents at the end of the year	11	**436,230**	**241,970**	**436,230**	**241,970**

STATEMENT OF COMPARISON OF BUDGET AND ACTUAL AMOUNTS for the year ended 31 March 2022

	(R thousands)					
Controlling entity	Approved budget	Adjustments	Final Budget	Actual amounts on comparable basis	Difference between final budget and actual	Reference
Statement of Financial Performance						
Revenue						
DSI allocation	447,703	–	**447,703**	447,703	**–**	Note 32
Other income	114,000	–	**114,000**	178,928	**64,928**	Note 32
Interest received	10,500	–	**10,500**	8,227	**(2,273)**	Note 32
Total revenue from exchange transactions	**572,203**	**–**	**572,203**	**634,858**	**62,655**	
Expenditure						
Employee related costs	(114,941)	–	**(114,941)**	(107,945)	**6,996**	Note 32
Project related funding	(406,620)	–	**(406,620)**	(458,856)	**(52,236)**	Note 32
Depreciation, amortisation and impairment	(6,875)	–	**(6,875)**	(3,563)	**3,312**	Note 32
Lease rentals on operating lease	(10,903)	–	**(10,903)**	(10,690)	**213**	
Other operating expenditure	(32,864)	–	**(32,864)**	(30,214)	**1,540**	Note 32
Total expenditure	**(572,203)**	**–**	**(572,203)**	**(611,268)**	**(40,175)**	
Operating surplus	–	–	**–**	**22,480**	**22,480**	
Gain on disposal of investments	–	–	**–**	175	**175**	
Surplus before taxation	**–**	**–**	**–**	**22,655**	**22,655**	
Actual Amount on Comparable Basis as Presented in the Budget and Actual Comparative Statement	**–**	**–**	**–**	**22,655**	**22,655**	

ACCOUNTING POLICIES
as at 31 March 2022

1. PRESENTATION OF CONSOLIDATED ANNUAL FINANCIAL STATEMENTS

The consolidated annual financial statements have been prepared in accordance with the Standards of Generally Recognised Accounting Practice (GRAP), issued by the Accounting Standards Board in accordance with Section 91(1) of the Public Finance Management Act (Act 1 of 1999).

These consolidated annual financial statements have been prepared on an accrual basis of accounting and are in accordance with historical cost convention as the basis of measurement, unless specified otherwise. They are presented in South African Rand. Amounts are rounded off to the nearest thousand.

These accounting policies are consistent with the previous period.

1.1 CONSOLIDATION

BASIS OF CONSOLIDATION

Consolidated annual financial statements are the consolidated annual financial statements of the economic entity presented as those of a single entity.

The consolidated annual financial statements incorporate the consolidated annual financial statements of the controlling entity and all controlled entity which are controlled by the controlling entity.

Consolidated annual financial statements are prepared using uniform accounting policies for like transactions and other events in similar circumstances.

Control exists when the controlling entity has the power to govern the financial and operating policies of another entity so as to obtain benefits from its activities.

The revenue and expenses of a controlled entity are included in the consolidated annual financial statements from the transfer date or acquisition date as defined in the Standards of GRAP on Transfer of functions between entities under common control or Transfer of functions between entities not under common control. The revenue and expenses of the controlled entity are based on the values of the assets and liabilities recognised in the controlling entity's consolidated annual financial statements at the acquisition date.

The consolidated annual financial statements of the controlling entity and its controlled entities used in the preparation of the consolidated annual financial statements are prepared as of the same date.

When the end of the reporting date of the controlling entity is different from that of a controlled entity, the controlled entity prepares, for consolidation purposes, additional consolidated annual financial statements as of the same date as the consolidated annual financial statements of the controlling entity unless it is impracticable to do so. When the consolidated annual financial statements of a controlled entity used in the preparation of consolidated annual financial statements are prepared as of a date different from that of the controlling entity, adjustments are made for the effects of significant transactions or events that occur between that date and the date of the controlling entity's consolidated annual financial statements. In any case, the difference between the end of the reporting date of the controlled entity and that of the controlling entity is no more than three months. The length of the reporting periods and any difference between the ends of the reporting dates is the same from period to period.

Adjustments are made when necessary to the consolidated annual financial statements of the controlled entities to bring their accounting policies in line with those of the controlling entity.

All intra-entity transactions, balances, revenues and expenses are eliminated in full on consolidation.

Non-controlling interest in the net assets of the economic entity is identified and recognised separately from the controlling entity's interest therein, and are recognised within net assets.

Changes in a controlling entity's ownership interest in a controlled entity that do not result in a loss of control are accounted for as transactions that affect net assets.

LOSS OF CONTROL

When a controlling entity loses control of a controlled entity, it:

- derecognises the assets and liabilities of the controlled entity at their carrying amounts at the date when control is lost;
- derecognises the carrying amount of any non-controlling interests in the former controlled entity at the date when control is lost (including any components in the statement of financial performance attributable to them);
- recognises:
  - the fair value of the consideration received (if any), from the transaction, event or circumstances that resulted in the loss of control; and
  - if the transaction that resulted in the loss of control involves a distribution of residual interests of the controlled entity to owners in their capacity as owners, that distribution;
- recognises any investment retained in the former controlled entity at its fair value at the date when control is lost;
- reclassifies to surplus or deficit, or transfers directly to accumulated surplus or deficit, if required in accordance with other accounting policies, the amounts identified; and
- recognises any resulting difference as a gain or loss in surplus or deficit (in accordance with the accounting policy on Transfer of functions between entities not under common control or in accordance with the accounting policy on Transfer of functions between entities under common control) attributable to the controlling entity.

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.1 CONSOLIDATION (CONTINUED)

On the loss of control of a controlled entity, any investment retained in the former controlled entity and any amounts owed by or to the former controlled entity are accounted for in accordance with other accounting policies from the date when control is lost.

The fair value of any investment retained in the former controlled entity at the date when control is lost is regarded as the fair value on initial recognition of financial assets in accordance with the Standard of GRAP on Financial instruments or when appropriate, the cost on initial recognition of an investment in an associate or jointly controlled entity.

INVESTMENT IN ASSOCIATES

An associate is an entity, over which the investor has significant influence and that is neither a controlled entity nor an interest in a joint venture. Significant influence is the power to participate in the financial and operating policy decisions of an activity but is not control or joint control over those policies.

An investment in associate is accounted for using the equity method. Under the equity method, investments in associates are carried in the consolidated statement of financial position at cost adjusted for post-acquisition changes in the economic entity's share of net assets of the associate, less any impairment losses.

The economic entity's share of the surplus or deficit of the investee is recognised in surplus or deficit.

The most recent available consolidated annual financial statements of the associate are used by the economic entity in applying the equity method. When the reporting dates of the economic entity and the associate are different, the associate prepares, for the use of the economic entity, consolidated annual financial statements as of the same date as the consolidated annual financial statements of the economic entity unless it is impractical to do so.

When the consolidated annual financial statements of an associate used in applying the equity method are prepared as of a different date from that of the economic entity, adjustments are made for the effects of significant transactions or events that occur between that date and the date of the economic entity's consolidated annual financial statements. In any case, the difference between the end of the reporting dates of the associate and that of the economic entity is no more than three months. The length of the reporting dates and any difference between the ends of the reporting dates is the same from period to period.

The economic entity's consolidated annual financial statements are prepared using uniform accounting policies for like transactions and events in similar circumstances.

Deficits in an associate in excess of the economic entity's interest in that associate are recognised only to the extent that the economic entity has incurred a legal or constructive obligation to make payments on behalf of the associate. If the associate subsequently reports surpluses, the economic entity resumes recognising its share of those surpluses only after its share of the surpluses equals the share of deficits not recognised.

The controlling entity discontinues the use of the equity method from the date that it ceases to have significant influence over an associate and account for the investment in accordance with the Standards of GRAP on Financial instruments from that date, unless the associate becomes a controlled entity or a joint venture, in which case it is accounted for as such. The carrying amount of the investment at the date that it ceases to be an associate is regarded as the fair value on initial recognition as a financial asset in accordance with the Standards of GRAP on Financial instruments.

1.2 SIGNIFICANT JUDGEMENTS AND SOURCES OF ESTIMATION UNCERTAINTY

In preparing the consolidated annual financial statements, management is required to make estimates and assumptions that affect the amounts represented in the consolidated annual financial statements and related disclosures. Use of available information and the application of judgement is inherent in the formation of estimates. Actual results in the future could differ from these estimates which may be material to the consolidated annual financial statements. Significant judgements include:

TRADE RECEIVABLES AND LOANS AND RECEIVABLES

The economic entity assesses its loans and receivables for impairment at the end of each reporting period. In determining whether an impairment loss should be recorded in surplus or deficit, the entity makes judgements as to whether there is observable data indicating a measurable decrease in the estimated future cash flows from a financial asset.

The impairment for loans and receivables is calculated on an individual basis, based on historical losses, financial position of the entity, repayment terms and the commercial viability of the business.

The impairment for loans and receivables is calculated on client by client basis based on client specific economic, operational and financial conditions that are present at the reporting date which correlate with defaults on the amounts owing by the client.

COMMITTED CONDITIONAL GRANTS

The economic entity assesses the split of amounts payable in the next twelve months at each reporting date. In determining the amount payable, consideration is taken of the expected disbursements for each programme. Such assessment requires judgement to be applied. Where such estimation cannot be reliably determined, such amounts are disclosed as non-current liabilities.

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.2 SIGNIFICANT JUDGEMENTS AND SOURCES OF ESTIMATION UNCERTAINTY (CONTINUED)

IMPAIRMENT TESTING

The recoverable amounts of individual assets have been determined based on the higher of value-in-use calculations and fair values less costs to sell. These calculations require the use of estimates and assumptions. It is reasonably possible that the assumptions used may change which may then impact our estimations and may then require a material adjustment to the carrying value of tangible assets.

The economic entity reviews and tests the carrying value of assets when events or changes in circumstances suggest that the carrying amount may not be recoverable. If there are indications that impairment may have occurred, estimates are prepared of expected future cash flows for each asset. Expected future cash flows used to determine the value in use of other assets which are inherently uncertain and could materially change over time.

ALLOWANCE FOR DOUBTFUL DEBTS

On debtors an impairment loss is recognised in surplus and deficit when there is objective evidence that it is impaired. The impairment is measured as the difference between the debtors carrying amount and the present value of estimated future cash flows discounted at the effective interest rate, computed at initial recognition.

1.3 PROPERTY, PLANT AND EQUIPMENT

Property, plant and equipment are tangible non-current assets that are held for use in the production or supply of goods or services, rental to others, or for administrative purposes, and are expected to be used during more than one period.

The cost of an item of property, plant and equipment is recognised as an asset when:
- it is probable that future economic benefits or service potential associated with the item will flow to the economic entity; and
- the cost of the item can be measured reliably.

The cost of an item of property, plant and equipment is the purchase price and other costs attributable to bring the asset to the location and condition necessary for it to be capable of operating in the manner intended by management. Trade discounts and rebates are deducted in arriving at the cost.

Where an asset is acquired through a non-exchange transaction, its cost is its fair value as at date of acquisition.

Where an item of property, plant and equipment is acquired in exchange for a non-monetary asset or monetary assets, or a combination of monetary and non-monetary assets, the asset acquired is initially measured at fair value (the cost). If the acquired item's fair value was not determinable, it's deemed cost is the carrying amount of the asset(s) given up.

When significant components of an item of property, plant and equipment have different useful lives, they are accounted for as separate items (major components) of property, plant and equipment.

Costs include costs incurred initially to acquire or construct an item of property, plant and equipment and costs incurred subsequently to add to, replace part of, or service it. If a replacement cost is recognised in the carrying amount of an item of property, plant and equipment, the carrying amount of the replaced part is derecognised.

Recognition of costs in the carrying amount of an item of property, plant and equipment ceases when the item is in the location and condition necessary for it to be capable of operating in the manner intended by management.

Items such as spare parts, standby equipment and servicing equipment are recognised when they meet the definition of property, plant and equipment.

Property, plant and equipment are depreciated on the straight-line basis over their expected useful lives to their estimated residual value.

Property, plant and equipment is carried at cost less accumulated depreciation and any impairment losses. The depreciable amount of an asset is allocated on a systematic basis over its useful life.
Each part of an item of property, plant and equipment with a cost that is significant in relation to the total cost of the item is depreciated separately.

The depreciation method used reflects the pattern in which the asset's future economic benefits or service potential are expected to be consumed by the economic entity. The depreciation method applied to an asset is reviewed at least at each reporting date and, if there has been a significant change in the expected pattern of consumption of the future economic benefits or service potential embodied in the asset, the method is changed to reflect the changed pattern. Such a change is accounted for as a change in an accounting estimate.

The economic entity assesses at each reporting date whether there is any indication that the economic entity expectations about the residual value and the useful life of an asset have changed since the preceding reporting date. If any such indication exists, the economic entity revises the expected useful life and/or residual value accordingly. The change is accounted for as a change in an accounting estimate.

The depreciation charge for each period is recognised in surplus or deficit.

Items of property, plant and equipment are derecognised when the asset is disposed of or when there are no further economic benefits or service potential expected from the use of the asset.

The gain or loss arising from the derecognition of an item of property, plant and equipment is included in surplus or deficit when the item is derecognised. The gain or loss arising from the derecognition of an item of property, plant and equipment is determined as the difference between the net disposal proceeds, if any, and the carrying amount of the item.

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.4 INTANGIBLE ASSETS

An asset is identifiable if it either:
- is separable, i.e. is capable of being separated or divided from an entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, identifiable assets or liability, regardless of whether the entity intends to do so; or
- arises from binding arrangements (including rights from contracts), regardless of whether those rights are transferable or separable from the economic entity or from other rights and obligations.

A binding arrangement describes an arrangement that confers similar rights and obligations on the parties to it as if it were in the form of a contract.

An intangible asset is recognised when:
- it is probable that the expected future economic benefits or service potential that are attributable to the asset will flow to the economic entity; and
- the cost or fair value of the asset can be measured reliably.

The economic entity assesses the probability of expected future economic benefits or service potential using reasonable and supportable assumptions that represent management's best estimate of the set of economic conditions that will exist over the useful life of the asset.

Where an intangible asset is acquired through a non-exchange transaction, its initial cost at the date of acquisition is measured at its fair value as at that date.

Intangible assets are carried at cost less any accumulated amortisation and any impairment losses.

An intangible asset is regarded as having an indefinite useful life when, based on all relevant factors, there is no foreseeable limit to the period over which the asset is expected to generate net cash inflows or service potential. Amortisation is not provided for these intangible assets, but they are tested for impairment annually and whenever there is an indication that the asset may be impaired. For all other intangible assets amortisation is provided on a straight-line basis over their useful life.

The amortisation period and the amortisation method for intangible assets are reviewed at each reporting date.

Amortisation is provided to write down the intangible assets, on a straight-line basis, to their residual values as follows:

Item	Depreciation method	Average useful life
Computer software	Straight-line	2 - 3 years
Website	Straight-line	5 years

1.5 INVESTMENTS IN CONTROLLED ENTITIES

ECONOMIC ENTITY CONSOLIDATED ANNUAL FINANCIAL STATEMENTS

Investments in controlled entities are consolidated in the economic entity's consolidated annual financial statements. Refer to the accounting policy on Consolidations (Note 1.1).

CONTROLLING ENTITY ANNUAL FINANCIAL STATEMENTS

In the entity's separate annual financial statements, investments in controlled entities are carried at cost. The entity applies the same accounting for each category of investment.
Investments in controlled entities that are accounted for in accordance with the accounting policy on Financial instruments in the annual financial statements, are accounted for in the same way in the controlling entity's separate annual financial statements.

When the entity loses control over a controlled entity it re-cognises the assets and liabilities of the controlled entity, and any related non-controlling interest and other components of equity. Any resulting gain or loss is recognised in the statement of financial position.

1.6 INVESTMENTS IN ASSOCIATES

ECONOMIC ENTITY CONSOLIDATED ANNUAL FINANCIAL STATEMENTS

An investment in an associate is accounted for using the equity method. Under the equity method, the investment is initially recognised at cost and the carrying amount is increased or decreased to recognise the economic entity's share of the surpluses or deficit of the investee after acquisition date. The use of the equity method is discontinued from the date the economic entity ceases to have significant influence over an associate.

Any impairment losses are deducted from the carrying amount of the investment in associate.

Surpluses and deficit resulting from transactions with associates are recognised only to the extent of unrelated investors' interests in the associate.

The most recent available annual financial statements of the associate are used by the investor in applying the equity method. When the end of the reporting period of the investor is different from that of the associate, the associate prepares, for the use of the investor, annual financial statements as of the same date as the annual financial statements of the investor unless it is impracticable to do so.

The recognition of the economic entity's share of losses is discontinued once the economic entity's share of losses of an associate equals or exceeds its interest in the associate.

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.6 INVESTMENTS IN ASSOCIATES (CONTNUED)

CONTROLLING ENTITY CONSOLIDATED ANNUAL FINANCIAL STATEMENTS

An investment in an associate is carried at cost less accumulated impairement.

The entity applies the same accounting for each category of investment.

1.7 FINANCIAL INSTRUMENTS

A financial instrument is any contract that gives rise to a financial asset of one entity and a financial liability or a residual interest of another entity.

The amortised cost of a financial asset or financial liability is the amount at which the financial asset or financial liability is measured at initial recognition minus principal repayments, plus or minus the cumulative amortisation using the effective interest method of any difference between that initial amount and the maturity amount, and minus any reduction (directly or through the use of an allowance account) for impairment or uncollectibility.

Credit risk is the risk that one party to a financial instrument will cause a financial loss for the other party by failing to discharge an obligation.

Currency risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in foreign exchange rates.

Derecognition is the removal of a previously recognised financial asset or financial liability from an entity's statement of financial position.

Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable willing parties in an arm's length transaction.

A financial asset is:
- cash;
- a residual interest of another entity; or
- a contractual right to:
  - receive cash or another financial asset from another entity; or
  - exchange financial assets or financial liabilities with another entity under conditions that are potentially favourable to the entity.

A financial liability is any liability that is a contractual obligation to:
- deliver cash or another financial asset to another entity; or
- exchange financial assets or financial liabilities under conditions that are potentially unfavourable to the entity.

Interest rate risk is the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates.

Liquidity risk is the risk encountered by an entity in the event of difficulty in meeting obligations associated with financial liabilities that are settled by delivering cash or another financial asset.

Loans payable are financial liabilities, other than short-term payables on normal credit terms.

A financial asset is past due when a counterparty has failed to make a payment when contractually due.

Transaction costs are incremental costs that are directly attributable to the acquisition, issue or disposal of a financial asset or financial liability. An incremental cost is one that would not have been incurred if the entity had not acquired, issued or disposed of the financial instrument.

Financial instruments at amortised cost are non-derivative financial assets or non-derivative financial liabilities that have fixed or determinable payments, excluding those instruments that:
- the entity designates at fair value at initial recognition; or
- are held for trading.

Financial instruments at cost are investments in residual interests that do not have a quoted market price in an active market, and whose fair value cannot be reliably measured.

CLASSIFICATION

The entity has the following types of financial assets (classes and category) as reflected on the face of the statement of financial position or in the notes thereto:

Class	Category
Investment in controlled entities	Financial asset measured at cost
Investment in associates	Financial asset measured at cost
Other financial assets	Financial asset measured at cost
Cash and cash equivalents	Financial asset measured at amortised cost
Loans and receivables	Financial asset measured at amortised cost

The entity has the following types of financial liabilities (classes and category) as reflected on the face of the statement of financial position or in the notes thereto:

Class	Category
Trade and other payables	Financial liability measured at amortised cost
Finance lease obligation	Financial liability measured at amortised cost

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.8 LEASES

A lease is classified as a finance lease if it transfers substantially all the risks and rewards incidental to ownership. A lease is classified as an operating lease if it does not transfer substantially all the risks and rewards incidental to ownership.

When a lease includes both land and buildings elements, the entity assesses the classification of each element separately.

FINANCE LEASES - LESSEE

Finance leases are recognised as assets and liabilities in the statement of financial position at amounts equal to the fair value of the leased property or, if lower, the present value of the minimum lease payments. The corresponding liability to the lessor is included in the statement of financial position as a finance lease obligation.

The discount rate used in calculating the present value of the minimum lease payments is the interest rate implicit in the lease.

Minimum lease payments are apportioned between the finance charge and reduction of the outstanding liability. The finance charge is allocated to each period during the lease term so as to produce a constant periodic rate of on the remaining balance of the liability.

Any contingent rents are expensed in the period in which they are incurred.

OPERATING LEASES - LESSEE

Operating lease payments are recognised as an expense on a straight-line basis over the lease term. The difference between the amounts recognised as an expense and the contractual payments are recognised as an operating lease asset or liability.

1.9 EMPLOYEE BENEFITS

SHORT-TERM EMPLOYEE BENEFITS

The cost of short-term employee benefits, (those payable within 12 months after the service is rendered, such as paid vacation leave and sick leave, bonuses, and non-monetary benefits such as medical care), are recognised in the period in which the service is rendered and are not discounted.

The expected cost of compensated absences is recognised as an expense as the employees render services that increase their entitlement or, in the case of non-accumulating absences, when the absence occurs.

The expected cost of surplus sharing and bonus payments is recognised as an expense when there is a legal or constructive obligation to make such payments as a result of past performance.

DEFINED CONTRIBUTION PLANS

Payments to defined contribution retirement benefit plans are charged as an expense as they fall due.

Payments made to industry-managed (or state plans) retirement benefit schemes are dealt with as defined contribution plans where the entity's obligation under the schemes is equivalent to those arising in a defined contribution retirement benefit plan.

1.10 CONTINGENCIES

Contingent assets and contingent liabilities are not recognised. Contingencies are disclosed in note 25.

1.11 REVENUE FROM EXCHANGE TRANSACTIONS

Revenue is the gross inflow of economic benefits or service potential during the reporting period when those inflows result in an increase in net assets, other than increases relating to contributions from owners.

An exchange transaction is one in which one entity receives assets or services, or has liabilities extinguished, and directly gives approximately equal value (primarily in the form of goods, services or use of assets) to the other party in exchange.

Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction.

MEASUREMENT

Revenue is measured at the fair value of the consideration received or receivable, net of trade discounts and volume rebates.

INTEREST AND ROYALTIES

Revenue arising from the use by others of entity assets yielding interest, royalties and dividends or similar distributions is recognised when:

- It is probable that the economic benefits or service potential associated with the transaction will flow to the entity, and
- The amount of the revenue can be measured reliably.

Interest is recognised using the effective interest rate method for financial instruments. Interest levied on transactions arising from exchange or non-exchange transactions is classified based on the nature of the underlying transaction.

Interest will not accure on loans and receivables where there is an indication that payment will be deferred in the short term. Royalties are recognised as they are earned in accordance with the substance of the relevant agreements.

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.12 REVENUE FROM NON-EXCHANGE TRANSACTIONS

Revenue comprises gross inflows of economic benefits or service potential received and receivable by an entity, which represents an increase in net assets, other than increases relating to contributions from owners.

Control of an asset arises when the entity can use or otherwise benefit from the asset in pursuit of its objectives and can exclude or otherwise regulate the access of others to that benefit.

Exchange transactions are transactions in which one entity receives assets or services, or has liabilities extinguished, and directly gives approximately equal value (primarily in the form of cash, goods, services, or use of assets) to another entity in exchange.

Non-exchange transactions are transactions that are not exchange transactions. In a non-exchange transaction, an entity either receives value from another entity without directly giving approximately equal value in exchange, or gives value to another entity without directly receiving approximately equal value in exchange.

RECOGNITION

An inflow of resources from a non-exchange transaction recognised as an asset is recognised as revenue, except to the extent that a liability is also recognised in respect of the same inflow.

As the entity satisfies a present obligation recognised as a liability in respect of an inflow of resources from a non-exchange transaction recognised as an asset, it reduces the carrying amount of the liability recognised and recognises an amount of revenue equal to that reduction.

MEASUREMENT

Revenue from a non-exchange transaction is measured at the amount of the increase in net assets recognised by the entity.

When, as a result of a non-exchange transaction, the entity recognises an asset, it also recognises revenue equivalent to the amount of the asset measured at its fair value as at the date of acquisition, unless it is also required to recognise a liability. Where a liability is required to be recognised it will be measured as the best estimate of the amount required to settle the obligation at the reporting date, and the amount of the increase in net assets, if any, recognised as revenue. When a liability is subsequently reduced, because the taxable event occurs or a condition is satisfied, the amount of the reduction in the liability is recognised as revenue.

1.13 COMPARATIVE FIGURES

Where necessary, comparative figures have been reclassified to conform to changes in presentation in the current year.

1.14 FRUITLESS AND WASTEFUL EXPENDITURE

Fruitless expenditure means expenditure which was made in vain and would have been avoided had reasonable care been exercised.

All expenditure relating to fruitless and wasteful expenditure is recognised as an expense in the statement of financial performance in the year that the expenditure was incurred. The expenditure is classified in accordance with the nature of the expense, and where recovered, it is subsequently accounted for as revenue in the statement of financial performance.

1.15 IRREGULAR EXPENDITURE

Irregular expenditure as defined in section 1 of the PFMA is expenditure other than unauthorised expenditure, incurred in contravention of or that is not in accordance with a requirement of any applicable legislation, including -

(a) this Act; or
(b) the State Tender Board Act, 1968 (Act No. 86 of 1968), or any regulations made in terms of the Act; or
(c) any provincial legislation providing for procurement procedures in that provincial government.

National Treasury practice note no. 2 of 2019/20 which was issued in terms of sections 76(2)e and section 76(4) of the PFMA requires the following (effective from 17 May 2019):

- Irregular expenditure is recorded at the transaction amount as and when it is incurred.
- Irregular expenditure that was incurred and identified during the current financial year and was condoned before year end and/or before finalisation of the financial statements must also be recorded appropriatly in the irregular expenditure register and the note to the financial statements.
- Irregular expenditure that was incurred and identified during the current financial year and for which condonement is being awaited at year end must be recorded in the irregular expenditure register and the note to the financial statements.
- Irregular expenditure is removed from the irregular expenditure register after consideration and application of paragragh 58(a) - (e) of the Irregular Expenditure Framework. Amounts removed are required to be disclosed within the notes to the financial statements.

1.16 SEGMENT INFORMATION

A segment is an activity of an entity:

- that generates economic benefits or service potential (including economic benefits or service potential relating to transactions between activities of the same entity);
- whose results are regularly reviewed by management to make decisions about resources to be allocated to that activity and in assessing its performance; and
- for which separate financial information is available.

Reportable segments are the actual segments which are reported on in the segment report. They are the segments identified above or alternatively an aggregation of two or more of those segments where the aggregation criteria are met.

ACCOUNTING POLICIES
as at 31 March 2022 (continued)

1.16 SEGMENT INFORMATION (CONTINUED)

MEASUREMENT

The amount of each segment item reported is the measure reported to management for the purposes of making decisions about allocating resources to the segment and assessing its performance. Adjustments and eliminations made in preparing the entity's financial statements and allocations of revenues and expenses are included in determining reported segment surplus or deficit only if they are included in the measure of the segment's surplus or deficit that is used by management. Similarly, only those assets and liabilities that are included in the measures of the segment's assets and segment's liabilities that are used by management are reported for that segment. If amounts are allocated to reported segment surplus or deficit, assets or liabilities, those amounts are allocated on a reasonable basis.

1.17 BUDGET INFORMATION

Economic Entity is typically subject to budgetary limits in the form of appropriations or budget authorisations, which is given effect through authorising legislation, appropriation or similar.

General purpose financial reporting by economic entity shall provide information on whether resources were obtained and used in accordance with the legally adopted budget.

The approved budget is prepared on an accrual basis and presented by economic classification linked to performance outcome objectives.

The approved budget covers the fiscal period from 01/04/2021 to 31/03/2022.

The consolidated annual financial statements and the budget are on the same basis of accounting therefore a comparison with the budgeted amounts for the reporting period have been included in the Statement of comparison of budget and actual amounts.

The Statement of comparative and actual information has been included in the consolidated annual financial statements as the recommended disclosure when the consolidated annual financial statements and the budget are on the same basis of accounting as determined by National Treasury.

1.18 RELATED PARTIES

A related party is a person or an entity with the ability to control or jointly control the other party, or exercise significant influence over the other party, or vice versa, or an entity that is subject to common control, or joint control.

Control is the power to govern the financial and operating policies of an entity so as to obtain benefits from its activities.

A related party transaction is a transfer of resources, services or obligations between the reporting entity and a related party, regardless of whether a price is charged.

Significant influence is the power to participate in the financial and operating policy decisions of an entity, but is not control over those policies.

Management are those persons responsible for planning, directing and controlling the activities of the economic entity, including those charged with the governance of the economic entity in accordance with legislation, in instances where they are required to perform such functions.

Close members of the family of a person are those family members who may be expected to influence, or be influenced by that person in their dealings with the economic entity.

The economic entity is exempt from disclosure requirements in relation to related party transactions if that transaction occurs within normal supplier and/or client/recipient relationships on terms and conditions no more or less favourable than those which it is reasonable to expect the economic entity to have adopted if dealing with that individual entity or person in the same circumstances and terms and conditions are within the normal operating parameters established by that reporting entity's legal mandate.

Where the economic entity is exempt from the disclosures in accordance with the above, the economic entity discloses narrative information about the nature of the transactions and the related outstanding balances, to enable users of the entity's financial statements to understand the effect of related party transactions on its consolidated annual financial statements.

1.19 EVENTS AFTER REPORTING DATE

Events after reporting date are those events, both favourable and unfavourable, that occur between the reporting date and the date when the financial statements are authorised for issue. Two types of events can be identified:

- those that provide evidence of conditions that existed at the reporting date (adjusting events after the reporting date); and
- those that are indicative of conditions that arose after the reporting date (non-adjusting events after the reporting date).

The economic entity will adjust the amount recognised in the financial statements to reflect adjusting events after the reporting date once the event occurred.

The economic entity will disclose the nature of the event and an estimate of its financial effect or a statement that such estimate cannot be made in respect of all material non-adjusting events, where non-disclosure could influence the economic decisions of users taken on the basis of the financial statements.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022

2. NEW STANDARDS AND INTERPRETATIONS

2.1 STANDARDS AND INTERPRETATIONS EFFECTIVE AND ADOPTED IN THE CURRENT YEAR

No new standards were adopted in the year under review.

2.2 STANDARDS AND INTERPRETATIONS ISSUED, BUT NOT YET EFFECTIVE

The economic entity has not applied the following standards and interpretations, which have been published and are mandatory for the economic entity's accounting periods beginning on or after 01 April 2022 or later periods:

Standard/ Interpretation:	Effective date: Years beginning on or after	Expected impact:
GRAP 104 (amended): Financial Instruments	01 April 2025	Impact is currently being assessed
GRAP 25 (amended): Employee Benefits	01 April 2025	Impact is currently being assessed
IGRAP 21: Effect of past decisions on materiality	01 April 2023	Unlikely there will be a material impact

3. PROPERTY, PLANT AND EQUIPMENT

	(R thousands)					
	March 2022			March 2021		
	Cost	Accumulated depreciation and impairment	Carrying value	Cost	Accumulated depreciation and impairment	Carrying value
Economic entity						
Furniture and office equipment	27,744	(23,859)	3,885	28,795	(23,622)	5,173
Motor vehicles	371	(350)	21	371	(329)	42
Leasehold improvements	1,864	(1,811)	53	1,798	(1,798)	–
Laboratory equipment	11,191	(10,034)	1,157	11,191	(9,656)	1,535
Total	**41,170**	**(36,054)**	**5,116**	**42,155**	**(35,405)**	**6,750**
Controlling entity						
Furniture and office equipment	27,744	(23,859)	3,885	28,795	(23,622)	5,173
Motor vehicles	371	(350)	21	371	(329)	42
Leasehold improvements	1,864	(1,811)	53	1,798	(1,798)	–
Laboratory equipment	11,191	(10,034)	1,157	11,191	(9,656)	1,535
Total	**41,170**	**(36,054)**	**5,116**	**42,155**	**(35,405)**	**6,750**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

3. PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

RECONCILIATION OF PROPERTY AND EQUIPMENT - ECONOMIC ENTITY - MARCH 2022

	(R thousands)				
	Opening balance	Additions	Disposals	Depreciation	Total
Furniture and office equipment	5,173	1,290	(40)	(2,538)	3,885
Motor vehicles	42	–	–	(21)	21
Leasehold improvements	–	65	–	(12)	53
Laboratory equipment	1,535	–	–	(378)	1,157
	6,750	**1,355**	**(40)**	**(2,949)**	**5,116**

RECONCILIATION OF PROPERTY AND EQUIPMENT - ECONOMIC ENTITY - MARCH 2021

Furniture and office equipment	7,458	1,250	(385)	(3,150)	5,173
Motor vehicles	83	–	–	(41)	42
Leasehold improvements	47	27	–	(74)	–
Laboratory equipment	2,530	42	(6)	(1,031)	1,535
	10,118	**1,319**	**(391)**	**(4,296)**	**6,750**

RECONCILIATION OF PROPERTY AND EQUIPMENT - CONTROLLING ENTITY - MARCH 2022

Furniture and office equipment	5,173	1,290	(40)	(2,538)	3,885
Motor vehicles	42	–	–	(21)	21
Leasehold improvements	–	65	–	(12)	53
Laboratory equipment	1,535	–	–	(378)	1,157
	6,750	**1,355**	**(40)**	**(2,949)**	**5,116**

RECONCILIATION OF PROPERTY AND EQUIPMENT - CONTROLLING ENTITY - MARCH 2021

Furniture and office equipment	7,458	1,250	(385)	(3,150)	5,173
Motor vehicles	83	–	–	(41)	42
Leasehold improvements	47	27	–	(74)	–
Laboratory equipment	2,530	42	(6)	(1,031)	1,535
	10,118	**1,319**	**(391)**	**(4,296)**	**6,750**

PLEDGED AS SECURITY

None of the assets above have been pledged as security or have restrictions on title.

DEPRECIATION RATES

Depreciation related to technology platform programmes is included in project expenditure.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

3. PROPERTY, PLANT AND EQUIPMENT (CONTINUED)

The depreciation methods and average useful lives of property, plant and equipment have been assessed as follows:

Item	Depreciation method	Average useful life
Leasehold improvements	Straight-line	Shorter of the period of the lease agreement or the useful life
Furniture and office equipment	Straight-line	2 - 13 years
Motor vehicles	Straight-line	2 - 12 years
Laboratory equipment	Straight-line	5 - 10 years

4. INTANGIBLE ASSETS

	(R thousands)					
	March 2022			March 2021		
	Cost	Accumulated depreciation and impairment	Carrying value	Cost	Accumulated depreciation and impairment	Carrying value
Economic entity						
Computer software	9,112	(8,374)	738	9,477	(8,027)	1,450
Website	873	(873)	–	873	(524)	349
Total	**9,985**	**(9,247)**	**738**	**10,350**	**(8,551)**	**1,799**
Controlling entity						
Computer software	9,112	(8,464)	738	9,477	(8,027)	1,450
Website	873	(873)	-	873	(524)	349
Total	**9,985**	**(9,337)**	**738**	**10,350**	**(8,551)**	**1,799**

RECONCILIATION OF INTANGIBLE ASSETS - ECONOMIC ENTITY - MARCH 2022

	(R thousands)				
	Opening balance	Additions	Transfers	Amortisation	Total
Computer software	1,450	–	–	(712)	738
Website	349	–	–	(349)	–
	1,799	**–**	**–**	**(1,061)**	**738**

RECONCILIATION OF INTANGIBLE ASSETS - ECONOMIC ENTITY - MARCH 2021

Computer software	3,028	192	(873)	(897)	1,450
Website	–	–	873	(524)	349
	3,028	**192**	**–**	**(1,421)**	**1,799**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

4. INTANGIBLE ASSETS (CONTINUED)

RECONCILIATION OF INTANGIBLE ASSETS - CONTROLLING ENTITY - MARCH 2022

	(R thousands)				
	Opening balance	Additions	Transfers received	Amortisation	Total
Computer software	1,450	–	–	(712)	738
Website	349	–	–	(349)	–
	1,799	**–**	**–**	**(1,061)**	**738**

RECONCILIATION OF INTANGIBLE ASSETS - CONTROLLING ENTITY - MARCH 2021

	Opening balance	Additions	Transfers received	Amortisation	Total
Computer software	3,028	192	(873)	(897)	1,450
Website	–	–	873	(524)	349
	3,028	**192**	**–**	**(1,421)**	**1,799**

The remaining carrying amount of the website was fully amortised during the year following planned replacement with a newly designed website aligned to the Agency's communications plan and strategy.

RESTRICTED TITLE

None of the above intangible assets have restrictions in title or have been pledged as security.

5. INVESTMENTS IN CONTROLLED ENTITIES

Name of company	Reporting period end	% holding March 2022	% holding March 2021	Carrying amount March 2022	Carrying amount March 2021
Investments in the process of deregistration/liquidation					
iThemba Pharmaceuticals (Pty) Ltd	31 December	50.10 %	50.10 %	–	–
Natural Carotenoids South Africa (Pty) Ltd	31 July	98.80 %	98.80 %	–	–
Bio2Biz (Pty) Ltd*	31 December	–	100.00 %	–	2,189
				–	**2,189**

The carrying amounts of controlled entities are shown net of impairment losses.

* The investment in Bio2Biz was deregistered during the current year and resulted in profit on disposal of R174,978.

CONTROLLED ENTITY'S REPORTING DATE IS DIFFERENT FROM THAT OF THE CONTROLLING ENTITY

Some of the controlled entities, have reporting dates that differ from the controlling entity. If the reporting date is within a three month period of the reporting period of the controlling entitiy, the annual financial statements for that peiod were used in consolidating the results of the entity. The management accounts for the entiities were reviewed in order to ensure that no significant changes took place between the reporting date and 31 March 2022.

Where the reporing dates differ with more than 3 months, a review of the financial affairs of the entity is performed up to the reporting date of the controlling entity and this is used for consolidation purposes.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

6. INVESTMENTS IN ASSOCIATES

Name of entity	Reporting period end	% holding March 2022	% holding March 2021	Carrying amount March 2022	Carrying amount March 2021
Active Investments					
Lifeassay (Pty) Ltd	28 February	26.00 %	26.00 %	–	296
Ribotech (Pty) Ltd	31 August	35.00 %	35.00 %	–	–
Tenacent SA (Pty) Ltd	28 February	20.00 %	20.00 %	234	–
Investments in process of deregistration/liquidation					
Niocad (Pty) Ltd	28 February	22.00 %	22.00 %	–	–
Edgi Tech (Pty) Ltd	28 February	26.00 %	26.00 %	–	–
Silverlake Trading (Pty) Ltd	28 February	28.00 %	28.00 %	–	–
Eyeborn (Pty) Ltd	31 March	25.00 %	25.00 %	–	–
Femtech (Pty) Ltd*	28 February	69.00 %	69.00 %	–	–
				234	296

The carrying amounts of associates are shown net of impairment losses.

* Although the controlling entity holds more than 50% of the voting powers, the investment is not considered a controlled entity because the controlling entity does not have control over the entity due to voting rights/appointment powers of Directors. These investments are therefore classified as investments in associates.

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021
Movements in carrying value				
Opening balance	296	555	–	–
Share of surplus/deficit	(62)	(259)	–	–
Closing balance	**234**	**296**	**–**	**–**

PRINCIPAL ACTIVITIES

Legal name	Principal activity
LifeAssay Diagnostics (Pty) Ltd	Manufacturer of vitro diagnostics test kits
Ribotech (Pty) Ltd	Manufacturing of rHOG CSF. Product is used in cancer treatment
Tenacent (Pty) Ltd	Development and sales of technical devices for the control of containe

All the above entities are incorporated in South Africa.

SUMMARY OF CONTROLLED ENTITY'S INTEREST IN ASSOCIATE

Total assets	2,394	1,380
Total liabilities	(61,720)	(58,362)
Revenue	3,427	4,296
Surplus (deficit)	(497)	(1,938)

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

6. INVESTMENTS IN ASSOCIATES (CONTINUED)

ASSOCIATES WITH DIFFERENT REPORTING DATES

Some of the associates have reporting dates that differ from the controlling entity. If the reporting date is within a three month period of the reporting period of the controlling entitiy, the annual financial staements for that peiod were used in consolidating the results of the entity. The management accounts for the entiities were reviewed in order to ensure that no significant changes took place between the reportinng date and the year end. The entity has utilised latest financial available information for the purposes of disclosure. In certain instances such disclosure is greater than a year old.

UNRECOGNISED SHARE OF LOSSES OF ASSOCIATES

The economic entity has discontinued recognising its share of the deficit of associate companies, as the investment is held at R nil and the economic entity has no obligation for any deficit of the associate. The total unrecognised deficit for the current period is R434,827 (2021: R1,822,547). The accumulated unrecognised deficit to date amount to R56,556,115 (2021: R56,313,881).

7. LOANS AND RECEIVABLES

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021
Other entities				
Agriprotein (Pty) Ltd*	4,486	7,894	4,486	7,894
The loan had fixed monthly repayment terms and interest was accrued at prime.				
Synexa (Pty) Ltd	2,114	3,411	2,114	3,411
This loan has fixed quarterly repayment terms over a period of 6 years and accrues interest at prime.				
The Biologicals and Vaccines Institute of Southern Africa (Pty) Ltd (Biovac)	23,300	23,300	23,300	23,300
The shareholder loan has no fixed date of repayment and currently bears no interest payment.				
	29,900	**34,605**	**29,900**	**34,605**
Non-current assets	23,925	25,410	23,925	25,410
Current assets	5,975	9,195	5,975	9,195
	29,900	**34,605**	**29,900**	**34,605**

LOANS TO ECONOMIC ENTITIES IMPAIRED

As of 31 March 2022, loans to economic entities of R119,663,958 (2021: R119,663,958) were impaired and provided for. The movement from the prior year to current year includes current year impairment.

* The economic entity holds collateral as security for the loan issued to Agriprotein (Pty) Ltd, even though the value thereof has diminished over time. This investment in Agriprotein (Pty) Ltd was impaired during the previous financial year due to the company being placed under business rescue. It is expected that the business rescue process will be concluded by 30 June 2022 and the provision for impairment will be reversed.

RECONCILIATION OF PROVISION FOR IMPAIRMENT ON LOANS AND RECEIVABLES

Opening balance	5,715	–	5,715	–
Provision for impairment	–	5,715	–	5,715
Closing Balance	**5,715**	**5,715**	**5,715**	**5,715**

The creation and release of provision for impaired receivables has been included in operating expenses in the statement of financial performance. Amounts charged to the allowance account are generally written off when the recovery of such amounts are improbable.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

8. OTHER FINANCIAL ASSETS

Designated at fair value				
The Biologicals and Vaccines Institute of Southern Africa (Pty) Ltd (Biovac)	3,000	3,000	3,000	3,000
This relates to a 12.5% shareholding loan with no fixed date of repayment and currently bears no interest payments.				

9. TRADE AND OTHER RECEIVABLES

Trade debtors	3,727	2,366	3,727	2,366
Deposits	270	270	270	270
Other receivables	6,967	2,593	6,967	2,593
Provision for bad debt	(6,445)	(4,194)	(6,445)	(4,194)
	4,519	**1,035**	**4,519**	**1,035**

Included in other receivables is R3,367,200 to be recovered from the DSI and an amount of R3,455,219 in respect of receivables for royalty commitments.

FAIR VALUE OF TRADE AND OTHER RECEIVABLES

The entity is of the opinion that the carrying value approximates the fair value of trade and other receivables at period end, due to the short term nature of these balances.

TRADE AND OTHER RECEIVABLES PAST DUE BUT NOT IMPAIRED

Trade and other receivables which are less than 3 months past due are not considered to be impaired. At 31 March 2022, R 3,367,200 (2021: R -) were past due but not impaired.

TRADE AND OTHER RECEIVABLES IMPAIRED

As of 31 March 2022, other receivables of R 6,445,000 (2021: R 4,194,000) were impaired and provided for. None of the trade debtors where considered to be impaired or needed to be provided for.

The ageing of these loans is as follows:				
3 to 6 months	3,423	3,132	3,423	3,132
Over 6 months	3,022	1,062	3,022	1,062

RECONCILIATION OF PROVISION FOR IMPAIRMENT OF TRADE AND OTHER RECEIVABLES

Opening balance	4,194	1,062	4,194	1,062
Provision for impairment	3,424	3,132	3,424	3,132
Reversal of provision for impairment	(1,173)	–	(1,173)	–
	6,445	**4,194**	**6,445**	**4,194**

The creation and release of provision for impaired receivables have been included in operating expenses in deficit. Amounts charged to the allowance account are generally written off when there is no expectation of recovering additional cash.

No collateral is held as security.

10. PREPAYMENTS

Prepayments comprises a total amount of R1,210,425 (2021: R1,233,496) for rentals for the Western Cape, Durban and Pretoria offices as well as Bio-Safety and Bio-Processing Platforms. In addition this amount also includes software licences totalling R2,121,381 (2021: R2,269,043) which are paid in advance.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

11. CASH AND CASH EQUIVALENTS

Cash and cash equivalents consist of:				
Bank balances	436,230	241,970	436,230	241,970

The carrying value approximates the fair value of cash and cash equivalents at period end, due to the short term nature of these balances.

The entity moved to a paycard system during the previous year and therefore no physical cash is held on hand.

12. FINANCE LEASE OBLIGATION

Minimum lease payments due				
– within one year	63	174	63	174
Present value of minimum lease payments due				
– within one year	63	174	63	174

It is the economic entity's policy to lease certain office equipment under finance leases. The remaining leases are expected to be completed within the next 12 months.

The average lease term is three years and the average effective borrowing rate is -% (2021: -%).

13. COMMITTED CONDITIONAL GRANTS

Committed conditional grants and receipts comprises of:				
Africa Programmes	11,584	6,200	11,584	6,200
Agriculture bio-economy partnership programme	23,196	13,598	23,196	13,598
Clothing & Textile Hub	4,678	–	4,678	–
Fibrelux technology diffusion initiative	38	36	38	36
Forest molecular genomics	–	–	–	–
ICT flagship programme	230	221	230	221
Bio-manufacturing Enterprise Management	19,746	–	19,746	–
Innovation for inclusive development	90,486	32,813	90,486	32,813
Joint technology innovation programme	1,392	1,341	1,392	1,341
Limpopo agri food technology station	133	128	133	128
Nuclear medicine	–	77	–	77
SABDI (Biodesign initiative programme)	6,004	12,577	6,004	12,577
Innovation Fund	128,030	55,711	128,030	55,711
Seed fund programme	239	60	239	60
Strategic industrial bio-innovation programme	10,097	14,545	10,097	14,545
Sugarcane research projects	–	1,150	–	1,150
Technology station programme	30,089	8,745	30,089	8,745
CPGR Rellocation	1,854	–	1,854	–
Vaccine Development & Management Strategy	3,044	–	3,044	–
	330,840	**147,202**	**330,840**	**147,202**
Movement during the year				
Balance at the beginning of the year	147,202	88,356	147,202	88,356
Additions during the year	351,908	219,746	351,908	219,746
Income recognition during the year	(168,270)	(160,900)	(168,270)	(160,900)
	330,840	**147,202**	**330,840**	**147,202**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

13. COMMITTED CONDITIONAL GRANTS (CONTINUED)

Non-current liabilities	56,672	20,533	56,672	20,533
Current liabilities	274,168	126,669	274,168	126,669
	330,840	**147,202**	**330,840**	**147,202**

Committed conditional grants represent specific contracts with primarily the DSI. Funds payable under the contract have been disclosed between amounts expected to outflow based on programme requirements.

Committed conditional grants have been split between current and non-current portions based on expected outflows from programmes.

14.TRADE AND OTHER PAYABLES

Trade payables	11,336	2,725	11,333	2,725
Employee related accruals	12,342	12,128	12,342	12,128
Other payables	25,507	50,160	25,507	52,346
	49,185	**65,013**	**49,182**	**67,199**

15. REVENUE FROM NON-EXCHANGE TRANSACTIONS

DSI allocation received during the year	447,703	408,825	447,703	408,825
Committed conditional grant funding recognised for:	–	–	–	–
Africa programme	5,962	818	5,962	818
Agriculture bio-economy partnerships programme	20,356	16,923	20,356	16,923
Bioprocessing	–	1,899	–	1,899
Innovation for inclusive development	12,773	22,048	12,773	22,048
Innovation Fund	31,877	25,237	31,877	25,237
Thought Leadership	3,367	–	3,367	–
SABDI (Biodesign initiative programme)	1,385	1,494	1,385	1,494
Seed fund programme	16,603	–	16,603	–
Strategic industrial bio-innovation programme	20,849	10,753	20,849	10,753
Technology Innovation Cluster Programme	77	3,108	77	3,108
Technology station programme	58,388	78,610	58,388	78,610
	619,340	**569,715**	**619,340**	**569,715**

16. OTHER INCOME

Royalties received	5,430	5,368	5,430	5,368
Sundry receipts	689	115	689	115
	6,119	**5,483**	**6,119**	**5,483**

17. INTEREST REVENUE

Investment revenue				
Interest earned - Loans and receivables	192	992	192	992
Interest earned - Bank	8,035	6,451	8,035	6,451
	8,227	**7,443**	**8,227**	**7,443**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

18. EMPLOYEE RELATED COSTS

Basic remuneration and re-imbursive allowances	90,500	85,410	90,500	85,410
Defined contribution plans	7,081	6,737	7,081	6,737
Performance bonus	7,062	5,620	7,062	5,620
Medical aid	3,302	3,286	3,302	3,286
	107,945	**101,053**	**107,945**	**101,053**

19. PROJECT FUNDING EXPENDITURE

Project grants - third party	458,856	419,247	458,856	419,247
Project funding is made up of the following:				
Africa programmes	5,962	818	5,962	818
Global cleantech innovation programme	1,000	2,623	1,000	2,623
Innovation for inclusive development	14,891	20,698	14,891	20,698
Innovation skills development programme	3,144	4,036	3,144	4,036
Seed fund programme	41,806	8,769	41,806	8,769
Technology Development	193,441	170,888	193,441	170,888
Technology innovation cluster programme	32,214	21,446	32,214	21,446
Technology platform programme	54,418	69,433	54,418	69,433
Technology station programme	107,014	114,354	107,014	114,354
Thought leadership & BioConvention	3,367	5,407	3,367	5,407
Youth technology innovation programme	1,599	775	1,599	775
	458,856	**419,247**	**458,856**	**419,247**

20. IMPAIRMENT

Impairment of financial assets at amortised cost	–	5,715	–	5,715
Provision for Bad debts	2,251	3,132	2,251	3,132
	2,251	**8,847**	**2,251**	**8,847**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

21. OTHER OPERATING EXPENSES

Other operating expenses include expenditure such as:				
Auditors remuneration	896	985	896	985
Cleaning	491	498	491	498
Consulting and professional fees	1,932	5,102	1,932	5,102
Electricity	1,761	1,583	1,761	1,583
IT expenses	8,260	7,037	8,260	7,037
Insurance	657	693	657	693
Marketing	408	94	408	94
Placement fees	231	1,433	231	1,433
Printing and stationery	171	184	171	184
Repairs and maintenance	75	464	75	464
Security	1,144	1,000	1,144	1,000
Sponsorships	–	71	–	71
Staff welfare	229	849	229	849
Subscription and certification costs	1,519	1,047	1,519	1,047
Telephone and fax	785	785	785	785
Training	3,743	33	3,743	33
Travel	3,290	650	3,290	650

22. TAXATION

The economic and controlling entity is exempt from income tax in terms of the provisions of section 10(1)(cA)(i) of the Income Tax Act.

23. CASH GENERATED FROM OPERATIONS

Surplus	22,593	13,968	22,655	14,227
Adjustments for:				
Depreciation and amortisation	4,010	5,717	4,010	5,717
Profit on sale of investments	(175)	–	(175)	–
Deficit/(surplus) from equity accounted investments	62	259	–	–
Fair value adjustments	–	–	–	–
Debt impairment	2,251	8,847	2,251	8,847
Interest on loan accounts	(192)	(992)	(192)	(992)
Assets written off	(28)	391	(28)	391
Changes in working capital:				
Trade and other receivables	(3,484)	(3,287)	(3,484)	(3,287)
Prepayments	172	444	172	444
Trade and other payables	(18,310)	10,630	(18,310)	13,221
	6,899	**35,977**	**6,899**	**38,568**

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

24. COMMITMENTS

Operating leases - as lessee (expense)

Minimum lease payments due				
– within one year	8,464	4,398	8,464	4,398
– in second to fifth year inclusive	–	1,394	–	1,394
	8,464	**5,792**	**8,464**	**5,792**

Operating lease payments represent rentals payable by the economic entity for certain of its offices. Leases are negotiated for an average term of five years and rentals are fixed for an average of three years. No contingent rent is payable. All the remaining leases' terms come to an end within the next financial year.

25. CONTINGENCIES

CONTINGENT LIABILITIES

Funding agreements:
These agreements will be funded using surplus cash and funds to be allocated in the financial periods in which these agreements become payable.

Funding agreements	238,741	177,501	238,741	238,741

Legal proceedings:
There are several legal proceedings that are currently ongoing, these legal proceedings relate to prior or existing investments made by the Technology Innovation Agency, either for refunds of grants, repayment of loans or incorrect disclosure on the value of shares sold.

The estimated costs are as follows:

Legal costs	3,200	3,760	3,200	3,760

CONTINGENT ASSETS

This matter relates to a sale of shares transaction whereby the Controlling entity disposed of its 49% shareholding in Kapa Biosystems (Pty) Ltd to Kapa Biosystems Inc. It later transpired that the purchase price for the shares was significantly undervalued and that TIA was infact entitled to an additional amount. The arbitration in this matter is presently ongoing. The amount owing to the Controlling entity is uncertain at this time.

26. RELATED PARTIES

Relationships	
Members	Refer to members' report note 27
Controlled entities	Refer to note 5
Associates	Refer to note 6
National Department	Department of Science and Innovation
National Government Business Enterprise	Council for Scientific and Industrial Research
National Public Entities	Agricultural Research Council
	Medical Research Council of South Africa
	The South African Nuclear Energy Corporation
	Mintek
	Insurance Sector Education Training Authority

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)	
	Controlling entity	
	March 2022	March 2021

26. RELATED PARTIES (CONTINUED)

RELATED PARTY BALANCES

Trade and Other Payables - Owing (to) by related parties		
Department of Science and Innovation	–	(36,813)
Amounts included in Trade receivable regarding related parties		
Department of Science and Innovation	3,367	–
Committed Conditional Grants		
Department of Science and Innovation	(330,840)	(147,202)

RELATED PARTY TRANSACTIONS

Allocations received		
Department of Science and Innovation	(619,340)	(569,715)
Transactions with		
Agricultural Research Council	5,334	1,565
Council for Scientific and Industrial Research	22,547	26,403
Medical Research Council for South Africa	12,328	9,412
Mintek	837	–
The South African Nuclear Energy Corporation	1,377	1,625
Insurance Sector Education Training Authority	1,935	–

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

27. MEMBERS EMOLUMENTS

EXECUTIVE MEMBERS

	(R thousands)			
	Emoluments	Bonus	Allowances*	Total
March 2022				
Mr P Krappie - Acting CEO (from 13/06/2020)	1,968	233	543	2,744
Mr I Abdoola - CFO	2,234	–	28	2,261
Mr BM Mphahlele	1,945	140	3	2,088
Dr VN Phehane	1,948	137	2	2,087
Mrs PA Dekker	1,823	183	–	2,006
Mr V Skosana (from 01/04/2021)	1,198	128	166	1,492
	11,116	**821**	**742**	**12,678**

* Allowances including the following: Cell phone, car, acting, travel and subsistence. Performance Bonuses paid during the period relate to the 2020/21 Financial year.

March 2021				
Mr P Krappie - Acting CEO (from 13/06/2020)	1,759	259	474	2,492
Mr I Abdoola - CFO (from 01/12/2020)	623	–	–	623
Ms F Levy Hassen - Acting CEO (from 12/06/2019 until 12/06/2020)	868	–	–	868
Mr W van der Merwe - CFO (until 30/06/2020)	790	–	5	795
Ms K Lourens - Acting CFO (from 01/07/2020 until 30/11/2020)	503	–	70	573
Mr M Molatudi (acting from 01/04/2020 until 31/07/2020)	535	–	77	612
Ms P Dekker	1,651	208	–	1,859
Ms S Pillay (acting from 01/07/2020 until 20/09/2020)	321	–	36	357
Mr BM Mphahlele (from 01/07/2020)	1,388	–	–	1,388
Mr E Mokhethi (acting from 01/04/2020 until 30/06/2020)	279	–	37	316
Dr VN Phehane (from 01/08/2020)	1,233	–	–	1,233
Mrs TY Nquma-Moyo (acting from 21/09/2020 until 31/03/2021)	902	127	120	1,149
	10,852	**594**	**819**	**12,265**

* Allowances including the following: Cell phone, car, acting and travel and subsistence.

Performance Bonuses paid during the 2020/21 period relate to the 2019/20 Financial year.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)		
	Members' fees	Allowances	Total

27. MEMBERS EMOLUMENTS (CONTINUED)

BOARD MEMBERS

March 2022			
Ms M Modise	70	–	70
Mr BA Mboniswa	131	–	131
Dr SJ Lennon (until 31/10/2021)	125	–	125
Dr M Madikizela (until 31/10/2021)	98	–	98
Mr TG Ramasike	183	–	183
Dr PL Mlengana (until 31/10/2021)	23	–	23
Ms JSP Matsebula	160	4	164
Ms A Canca	43	–	43
Dr R Iyer	41	–	41
Ms L Matlali	48	–	48
	922	**4**	**926**

The members did not receive any allowances during the current financial year.

March 2021			
Mr BA Mboniswa	230	–	230
Dr SJ Lennon	226	–	226
Dr M Madikizela	193	–	193
Ms JSP Matsebula	152	–	152
Dr PL Mlengana	96	–	96
Mr TG Ramasike	230	–	230
	1,127	–	1,127

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

28. RISK MANAGEMENT

FINANCIAL RISK MANAGEMENT

The economic entity's activities expose it to a variety of financial risks: market risk (including currency risk, fair value interest rate risk, cash flow interest rate risk and price risk), credit risk and liquidity risk.

LIQUIDITY RISK

The economic entity's risk to liquidity is a result of the funds available to cover future commitments. The economic entity manages liquidity risk through an ongoing review of future commitments and credit facilities.

ECONOMIC ENTITY

	(R thousands)			
	Less than 1 year	Between 1 and 2 years	Between 2 and 5 years	Over 5 years
At 31 March 2022				
Trade and other payables	49,185	–	–	–
Finance Lease	63	–	–	–
At 31 March 2021				
Trade and other payables	65,013	–	–	–
Finance Lease	174	–	–	–

CONTROLLING ENTITY

At 31 March 2022				
Trade and other payables	49,182	–	–	–
Finance Lease	63	–	–	–
At 31 March 2021				
Trade and other payables	67,199	–	–	–
Finance Lease	174	–	–	–

CREDIT RISK

Credit risk consists mainly of cash deposits, cash equivalents and trade debtors. The entity only deposits cash with major banks with high quality credit standing and limits exposure to any one counter-party.

Loans and receivables, investment in controlled entities, investment in associates and other investments consist mainly of funding granted to start up companies. The exposure to credit risk is managed through ongoing review of the operating results and financial position of the investee companies. Should the entity have doubt over the recoverability of the loan of the value of the investment, the loan/investment is impaired and further funding is carefully considered.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

28. RISK MANAGEMENT (CONTINUED)

Financial assets exposed to credit risk at year end were as follows:

	(R thousands)			
	Economic entity - 2022	Economic entity - 2021	Controlling entity - March 2022	Controlling entity - March 2021
Financial instrument				
Cash and cash equivalents	436,230	241,970	436,230	241,970
Trade and other receivables	10,964	5,229	10,964	5,229
Loans and receivables	35,615	54,578	35,615	54,578

The entity has little doubt over the recoverability of trade and other receivables not considered to be impaired at year end.

The entity has reviewed the financial position of each of the entities where they have not impaired the loan disbursed or investment made to the investee company based on the management is of the opinion that at the period end the amount is recoverable.

MARKET RISK

INTEREST RATE RISK

Changes in interest rates will affect the revenue from exchange transaction revenue stream as the return on investment of surplus funds is linked to the prime rate.

CASH FLOW INTEREST RATE RISK

	(R thousands)					
	Current interest rate	Due in less than a year	Due in one to two years	Due in two to three years	Due in three to four years	Due after five years
Financial instrument						
Cash reserves at Standard Bank	2.15 %	91,169	–	–	–	–
Cash reserves at CPD (SARB)	4.17 %	345,061	–	–	–	–

FOREIGN EXCHANGE RISK

The economic entity does not hedge foreign exchange fluctuations.

The economic entity reviews its foreign currency exposure, including commitments on an ongoing basis.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

	(R thousands)			
	Economic entity		Controlling entity	
	March 2022	March 2021	March 2022	March 2021

29. FRUITLESS AND WASTEFUL EXPENDITURE

Opening balance as previously reported	85	80	–	–
Opening balance as restated	**85**	**80**	**–**	**–**
Add: Expenditure identified - current	–	5	–	–
Closing balance	**85**	**85**	**–**	**–**

Economic Entity: Prior year – The nature of the expense (R5,486) that could be avoided are interest and penalties in taxes for one controlled entity that is currently under de-registration. An amount of R685 will be recovered from the previous shareholder.

30. IRREGULAR EXPENDITURE

Opening balance as previously reported	11,620	10,752	3,697	2,829
Opening balance as restated	**11,620**	**10,752**	**3,697**	**2,829**
Add: Irregular Expenditure - current	292	868	292	868
Closing balance	**11,912**	**11,620**	**3,989**	**3,697**

NARRATIVE

Economic entity: 13 controlled entities were inherited when the trusts (Biopad, Lifelab, Plantbio, Tshumisano, Innovation Fund, Cape Biotech Trust) were combined to form TIA. The entities were not set up to comply with the detail requirements of Treasury Regulation 16A6.1. The controlling entity is continuing to exit these entities and of the original 13 only 5 are remaining.

Controlling entity: Irregular expenditure has been highlighted, which relates to the manner in which the ex-interim CEO Ms Fuzlin Levy-Hassen was appointed and the remuneration paid to her for services rendered in this capacity. Ms. Fuzlin Levy- Hassen's contract came to an end on 12 June 2020. Additional irregular expenditure was incurred in the current year as a result of an arbitration award in her favour. Prior periods expenditure has been submitted to the accounting authority for removal from the irregular expenditure register following engagement and response by National Treasury in regards to the condonation request.

31. SEGMENT INFORMATION

GENERAL INFORMATION

IDENTIFICATION OF SEGMENTS

The economic entity is organised and reports to management on the basis of four major functional areas and administration: Bio-economy, Commercialisation, Strategic Engagements and Corporate Relations and Administration. The segments were organised around the type of service delivered and the target market within the National System of Innovation. Management uses these same segments for determining strategic objectives. Segments were aggregated for reporting purposes. The segments have changed from the prior financial year as the current mechanism of reporting is more accurate and aligned to the new 5 year strategic plan.

Information reported about these segments is used by management as a basis for evaluating the segments' performances and for making decisions about the allocation of resources. The disclosure of information about these segments is also considered appropriate for external reporting purposes.

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

31. SEGMENT INFORMATION (CONTINUED)

SEGMENT SURPLUS OR DEFICIT

Controlling entity - March 2022

	(R thousands)					
	Bio-economy	Commer-cialisation	Innovation Enabling Programmes	Technology Stations Programmes	Administration and strategic engagements	Total
Revenue						
Revenue	257,054	103,242	74,021	107,262	77,761	619,340
transactions	192					
Interest received		–	–	–	8,035	8,227
Other Income	175	5,430	–	–	689	6,294
Total segment revenue	**257,421**	**108,672**	**74,021**	**107,262**	**86,485**	**633,861**
Entity's revenue						**633,861**
Expenditure						
Employee related costs	28,037	16,703	17,902	1,877	43,426	107,945
Project funding expenditure	221,552	86,005	44,037	107,262	–	458,856
Other operating expenditure	894	534	1,582	–	41,395	44,405
Total segment expenditure	**250,483**	**103,242**	**63,521**	**109,139**	**84,821**	**611,206**
Total segmental surplus/(deficit)						**22,655**

Controlling entity - March 2021

Revenue						
Revenue	197,046	78,902	28,070	114,354	151,343	569,715
Interest received	992	–	–	–	6,451	7,443
Other income	115	5,368	–	–	–	5,483
Total segment revenue	**198,153**	**84,270**	**28,070**	**114,354**	**157,794**	**582,641**
Entity's revenue						**582,641**
Expenditure						
Employee related costs	16,640	16,870	15,520	2,439	49,584	101,053
Project funding expenditure	197,046	78,902	28,070	114,354	875	419,247
Other operating expenditure	36	83	721	–	47,533	48,373
Total segment expenditure	**213,722**	**95,855**	**44,311**	**116,793**	**97,992**	**568,673**
Total segmental surplus/(deficit)						**13,968**

,

NOTES TO THE ANNUAL FINANCIAL STATEMENTS
as at 31 March 2022 (continued)

32. BUDGET DIFFERENCES

MATERIAL DIFFERENCES BETWEEN BUDGET AND ACTUAL AMOUNTS

The following outlines differences between budget and actual amounts which are greater than R1.5 million.

Other income – Positive variance in other income was attributable largely due to additional funds managed through specific programmes managed on behalf of the DSI.

Interest earned: A reduction in interest revenue was attributable to reductions in repo rate by the South African Reserve Bank In addition, lower interest was earned on loans due to one project being business rescue.

Project related funding: Increases were attributable to additional funds managed through specific programmes on behalf of the DSI. The Agency served as an implementor of the Sovereign Innovation Fund during the 202/21 and 2021/22 financial years and resulted in additional capital available for project disbursement.

Employee related costs: Employee costs were lower than budget attributable to both a higher vacancy ratio and savings realised from later than anticipated filling of vacancies.

Depreciation, armotisation and impairment: The variance is attributable largely due to capital expenditure which was deferred to the 2022/23 financial year as well as impact from the processing of the revision of useful lives adjustment in line with GRAP 17 requirements.

Other operating expenditure: The Agency experienced a general reduction in operating expenditure as a result of COVID-19 lock down levels. Operational savings recognized through the year were re-allocated to project expenditure resulting in an improved overall efficiency ratio.

technology innovation
AGENCY
Innovating Tomorrow Together

Gauteng Head Office

+27 (0) 12 427 2700

Postal Address
P.O. Box 172
Menlyn
Pretoria
0181

Physical Address
TIA House
83 Lois Avenue
Menlyn
Pretoria

KwaZulu-Natal Office

+27 (0) 31 220 3101

Postal Address
P.O. Box 30603
Mayville
Durban
4058

Physical Address
4th Floor
102 Stephen Dlamini Road
Musgrave
Durban

Western Cape Office

+27 (0) 21 442 3780

Postal Address
P.O. Box 13372
Mowbray
Cape Town
7705

Physical Address
4th Floor, Central Park
Black River Business Park
Fir Road, Observatory
Cape Town

www.tia.org.za

@tiaorgza tiaorgza www.linkedin.com/company/technology-innovation-agency

RP274/2022
ISBN: 978-0-621-50620-4